The Electrical Industry's Weekly Magazine

August 18, 1958

Electrical World

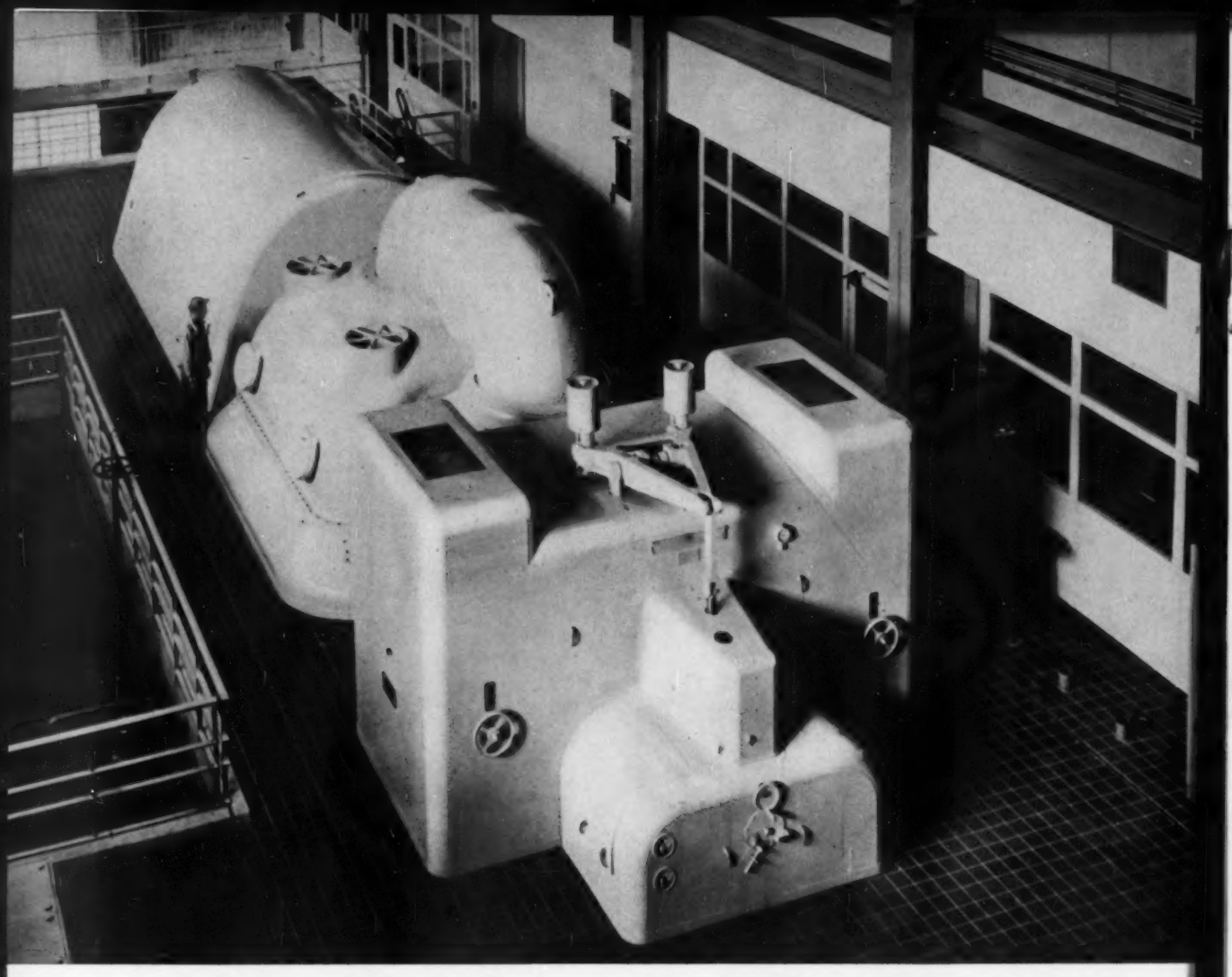
Price 50 Cents

A McGraw-Hill Publication

New Methods Speed Line Construction ... p 65

Business Outlook: A Strong Second Half ... p 109

E B POWER GS
UNIVERSITY MICROFILMS
313 N 1 ST
ANN ARBOR MICH



Cut rust and oxidation — boost efficiency with Texaco Regal Oil R&O

There's extra service built into Texaco Regal Oil R&O because it gives dependable protection against rust and oxidation as it lubricates. It's a first rate lubricant fortified with extra resistance to the formation of rust, sludge and foam.

The additives in Texaco Regal Oil R&O keep systems clean. The oil circulates freely throughout an extra-long service life. The bearings stay cool and the governor runs steadily and dependably.

There is a complete line of Texaco Regal Oils R&O to give long-term protection to any type or size of turbine. A Texaco Lubrication Engineer will be glad to help you select the right oil for your equipment. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

Electrical World

Vol. 150, No. 7 AUGUST 18, 1958

Published for 84 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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PROVE IT FOR YOURSELF. CM-OT finish (left), with helically-wrapped corrugated bronze tape, withstands compression to a much greater degree than a Parkway-type finish with a flat metal tape twice the thickness (right).

CM-OT* gives more compressive strength with half the thickness of metal tape

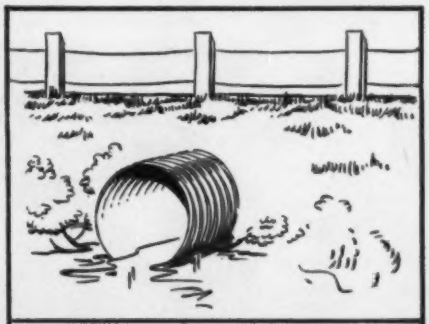
Now you can have a high strength cable covering without resorting to bulky or hard to train direct burial constructions. Okonite CM-OT covering provides a light weight, flexible, small diameter cable of great compressive strength. It offers an excellent combination of installation and maintenance savings for many types of cables—control, communication, power or lighting.

Originally designed for direct burial, CM-OT cables are also readily installed aerially, in conduit, in racks or in underground ducts . . . permitting you to stock one type of cable for many uses.

The corrugated bronze tape that's the heart of the cable covering is permanently bonded to a tough wall of Okoprene, with an Okoprene-filled tape applied overall. This composite covering—bronze plus neoprene—provides a barrier against rodents, termites, moisture, oils or sunlight as well as corrosion by soil alkalies and acids. CM-OT also acts as a two-way cushion and "shield" against the stress of shifting stones and mechanical impact that might damage the vital conductor insulation in service. Electrically, the bronze tape serves as an excellent shield, and "ground" where necessary.

Where your environmental conditions demand different corrosion-resistant properties, CM-PF finish is available with Okoseal (polyvinyl chloride) or Okolene (polyethylene) bonded to the corrugated bronze tape instead of Okoprene. This should be considered particularly where petrochemicals are present.

Flexible . . . easy to handle, splice and terminate—CM-OT is a quality construction you'll find it profitable to become better acquainted with. For the full story, including actual test figures on the samples in the photograph, send for Bulletin EW-1121, The Okonite Company, Passaic, New Jersey.



Corrugation = strength plus lightness
Just as corrugated construction adds strength to underground pipes, so corrugation of shielding tape permits the construction of a stronger, lighter, more flexible and more easily handled cable—CM-OT.

*Patent No. 2722562

where there's electrical power . . . there's **OKONITE CABLE**

6130-A

You May Want To Hedge

Would you lean back for a minute and look ahead ten years.

Now divide the country into the areas where they are now promoting or will promote electric space heating and the areas where another fuel will continue to predominate. Also assume, if you will, that gas air conditioning just does not sell in quantity.

Now visualize the electric system load factor in each of these areas.

What do you find?

Well, each of you will come up with a different answer but we suspect the prospects in some areas will not be too comfortable.

Now go one step further and consider the average use per residential customer. For some companies it will be up to 15,000 kilowatt-hours while in others the use will be as low as 4,000 kilowatt-hours.

Then consider the rates that will be required to produce an adequate return under these different conditions.

These are the things that the buyers of utility securities will be looking at. We hope they will find satisfaction in all areas but we would not want to place any wagers.

Maybe it would be a better gamble for all companies to hedge with electric space heating promotion to assure traditional growth rates.

Fischer Black

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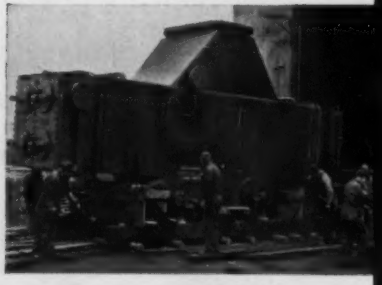
Another Example of Allis-Chalmers

Other Allis-Chalmers Firsts

First condenser with welded tubes to insure against condensate contamination. Welded construction forms a seal with tube sheets to meet new problems created by supercritical pressure, nuclear power, and once-through boiler installations.

First condenser for first commercial-type nuclear power plant in operation is Allis-Chalmers 5300-sq-ft unit with aluminum tubes, double tube sheets, special leak tightness.



A-C ALLIS-CHALMERS

A-5693

Condenser Leadership

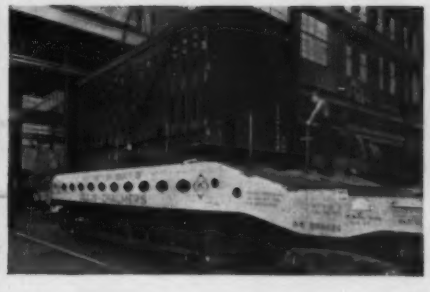
World's Largest Condenser

200,000-square-foot single-shell condenser for Commonwealth Edison

Engineering ability to handle the extraordinary jobs, such as this giant unit, accounts for Allis-Chalmers continued leadership in condenser development. The unit will serve another A-C achievement—a 327 mw steam turbine generator at the utility's Fisk Station.

Installation of so large a condenser is not a simple task. However, a unique method devised by A-C is used to minimize erection problems. Complete factory assembly aligns the sections perfectly. Dowel and pull-up blocks are installed at each joint to insure exact alignment when condenser is reassembled in the field. Specially built freight cars permit shipment of the entire shell in only four sections.

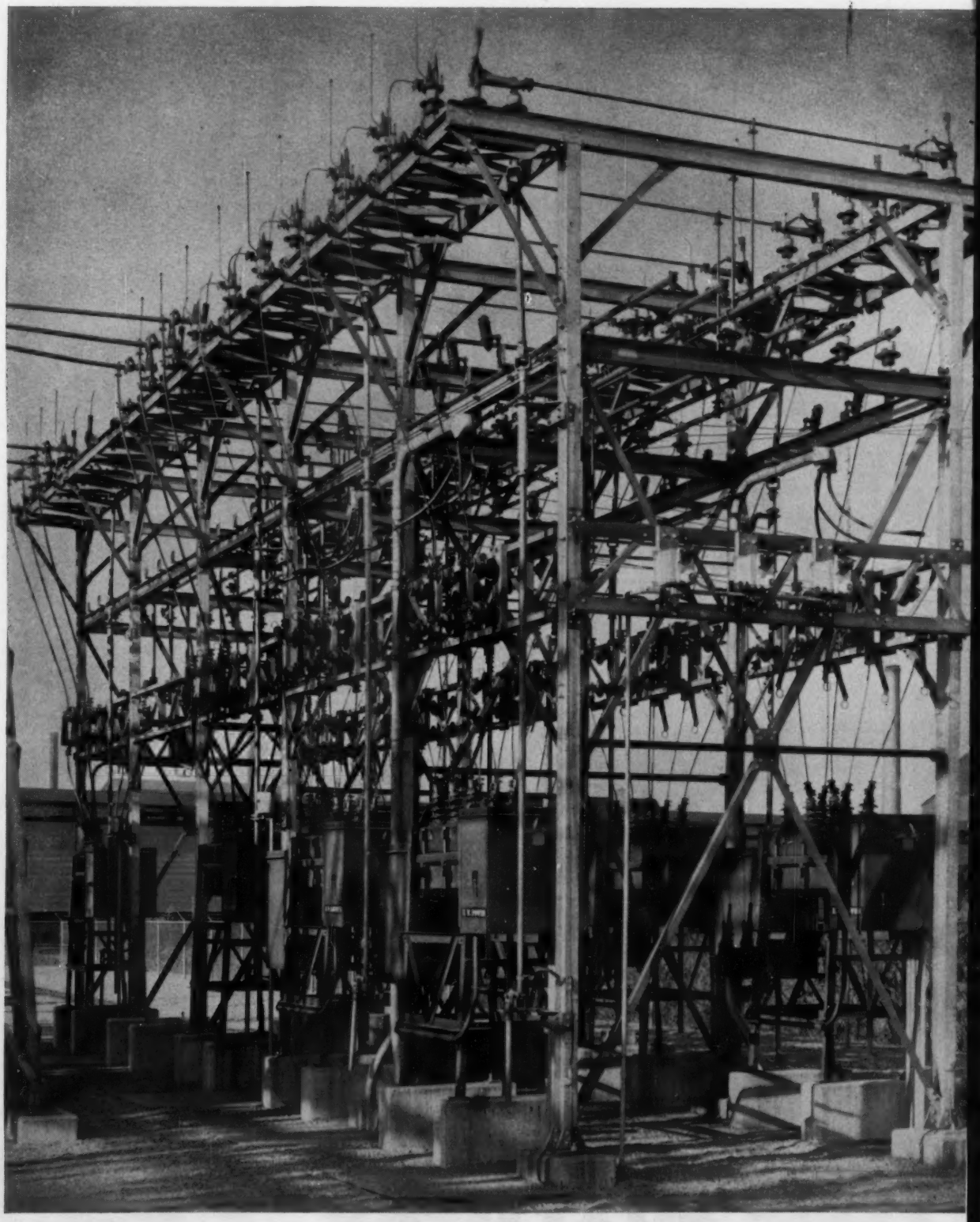
For more information on the most advanced developments in condenser engineering, call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



First with specially built freight cars to accommodate large condenser sections, thereby reducing shipping problems, cutting installation time and costs.

First full-size condenser in public utility to incorporate aluminum tubes. This installation is part of a long-range study that may lead to industry-wide savings.

ALLIS-CHALMERS



THIS STRUCTURE WENT UP IN A DAY

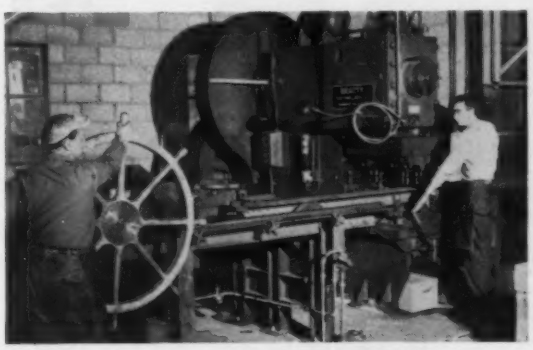
It's aluminum—it's light and strong—it will last

R&IE designs and fabricates aluminum or steel substation structures under one roof. Complete control and supervision virtually eliminates on-the-site rework, thereby speeding installation.

Some 7000 prepunched holes were required for this structure, and no rework was necessary for proper fit. This aluminum alloy structure for Penelec in Erie, Pa., was erected in one day, ready for equipment and bus work. An identical galvanized steel structure could have been erected in a proportionately short time. Accurate detailing, fabricating and member identification resulted in orderly and fast field assembly.

Fast installation . . . proper design . . . efficient use of materials . . . these are extra benefits for you made possible by R&IE's complete engineering and manufacturing facilities. Experienced substation engineers study your particular requirements . . . electrical clearances, wire pull, weather and switching. Designs reflecting their specialized knowledge are then translated, via detail drawings, into fabricated parts. Engineering, design and fabrication all take place under one roof. Of all substation manufacturers, R&IE alone has offered this unified, complete service for almost half a century.

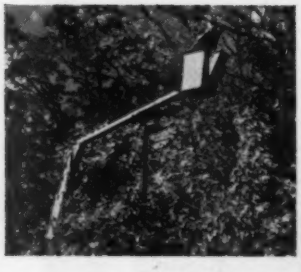
If your planning includes substation structures for transmission, distribution or industrial service entrance, let R&IE's longer, broader experience save you time and cost. For full information, consult your I-T-E representative or write R&IE Equipment Division, Greensburg, Pa. In Canada: Eastern Power Devices Ltd., Port Credit, Ont.

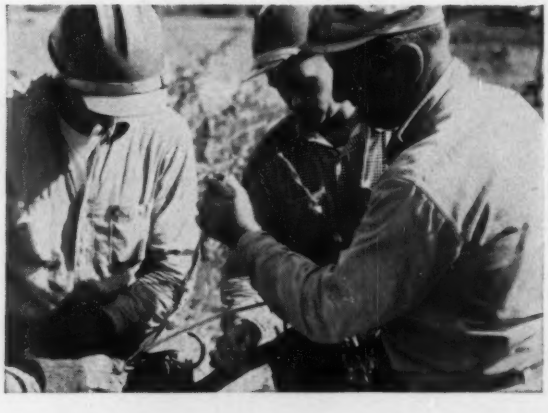


Substation specialists. R&IE craftsmen, using custom-designed tools and machines, such as the unique punched hole spacing table shown here, are specialists in the production of substation structural components. Specialized tooling and skilled workmanship assure on-time delivery and rapid, trouble-free assembly.

I-T-E CIRCUIT BREAKER COMPANY
R&IE EQUIPMENT DIVISION · Greensburg, Pa.

Green Garden substation, Erie, Pa. Built for the Pennsylvania Electric Co., with use of preassembled trusses. All-aluminum construction reduces maintenance to an absolute minimum. The first all-aluminum substation ever built was produced by R&IE in 1947.





SAVE YOURSELF THAT SECOND TRIP

when you string a power line

"Spinning" an aerial cable means going over your work twice—once to string the messenger, and again to bind the cable. It costs you valuable installation time.

Rome's preassembled aerial cable can save you that time—and the extra trip. It has a messenger *ready-bound* to the cable and can be installed much faster than its field-assembled *or* open-wire counterparts. And it provides other advantages for:

Storm protection

Stronger than open-wire systems, Rome's preassembled aerial cable reduces the danger of damage resulting from storms. Falling branches—or even trees—can be supported by the cable itself.

Reduced tree trimming

Initial and periodic tree trimming are reduced to a minimum. In a recent installation of Rome's preassembled aerial cable, it was estimated that tree trimming would not be required for five years, in contrast to the normal two-year period for open-wire systems.

Ease of tapping

The reverse-lay construction of Rome's preassembled cable permits tapping anywhere along the line instead of just at termination points.

Improved regulation

Aerial cable has a lower reactance than open-wire systems—so voltage drop is approximately half as great. Similarly, for a given allowable voltage drop, power can be transmitted twice as far.

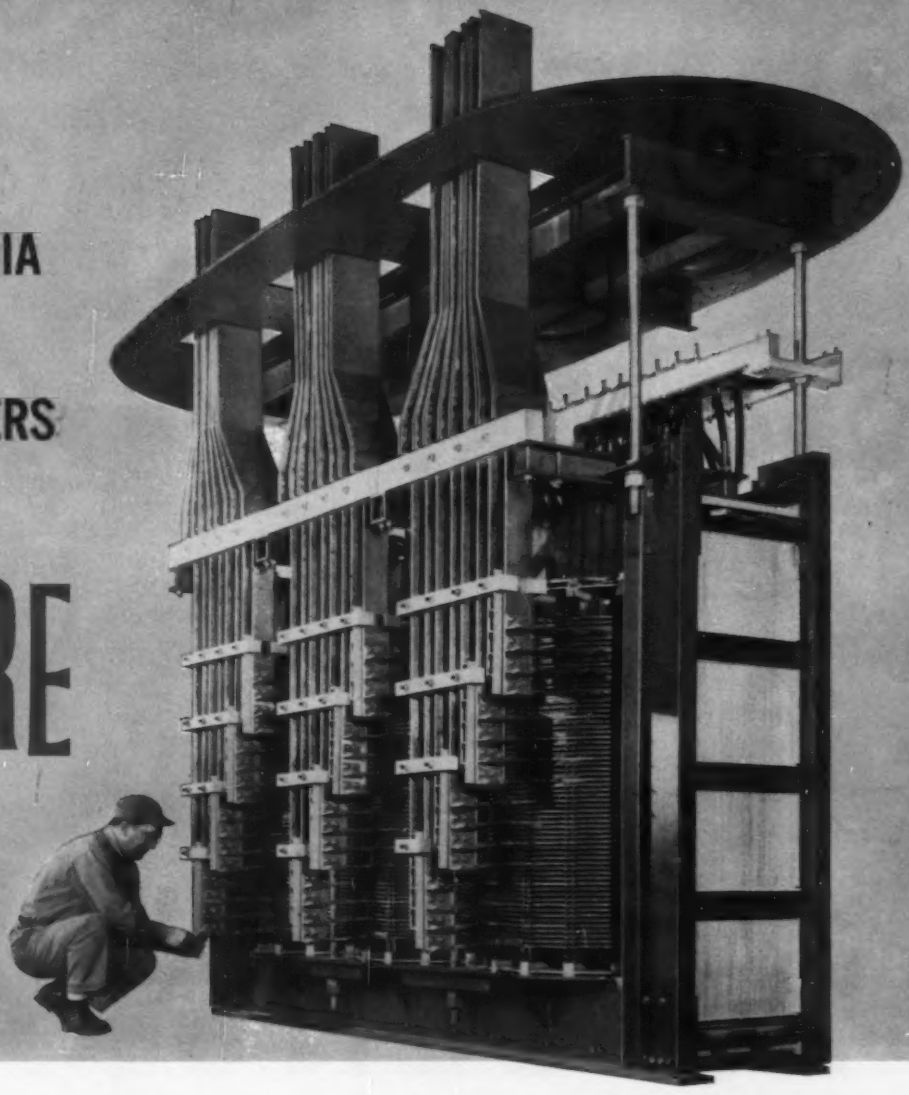
Improved appearance

No crossarms are needed with Rome's preassembled cable . . . the installation is simple, uncluttered, modern in appearance.

For more facts on this cable that can help *you* cut installation, operating, and maintenance costs, contact your nearest Rome Cable representative, or write to Dept. 772-B, Rome Cable Corporation, Rome, New York.

ROME CABLE
CORPORATION

How PENNSYLVANIA FURNACE TRANSFORMERS take the TORTURE of Year-in, Year-out Service



Furnace transformers are subjected to repeated short circuits and heavy overloads in ordinary service. Distribution of currents and reduction of copper eddy losses also must be given special consideration.

Throughout the years, Pennsylvania Transformer has earned an unsurpassed reputation for meeting these challenges—in installations ranging from 250 through 25,000 kva, and from 3175 through 82,000 amperes. Here are some of the reasons.

Balanced, Precompressed Coils

Coils are balanced to reduce axial short-circuit forces to a minimum . . . and the circular shape protects the coils against deformation by radial short-circuit forces. Also, coils are precompressed with a pressure equal to the maximum short-circuit force that might occur in service. As a result, no additional distortion or displacement can take place.

Bracing of Coils, Bus Bars

Coils are firmly braced, top and bottom, by clamping plates attached to structural steel frames. The accompanying photograph also shows the sturdy supports used for low voltage bus bars. Interleaving of bus bars tends to counterbalance the lines of force and prevent distortion during short circuits.

Distribution of Current

Because of the heavy secondary currents, the winding is subdivided into numerous parallel sections. Transposition of the individual conductors of each section reduces copper eddy losses to a minimum. This results in improved efficiency, more uniform copper temperature, and prevention of hot spots.

To take advantage of these and other time-proved features of Pennsylvania Furnace Transformers . . . contact Pennsylvania Transformer Division, McGraw-Edison Company, Box 330, Canonsburg, Pa.

NEW EXTERNALLY-MOUNTED TAP CHANGER

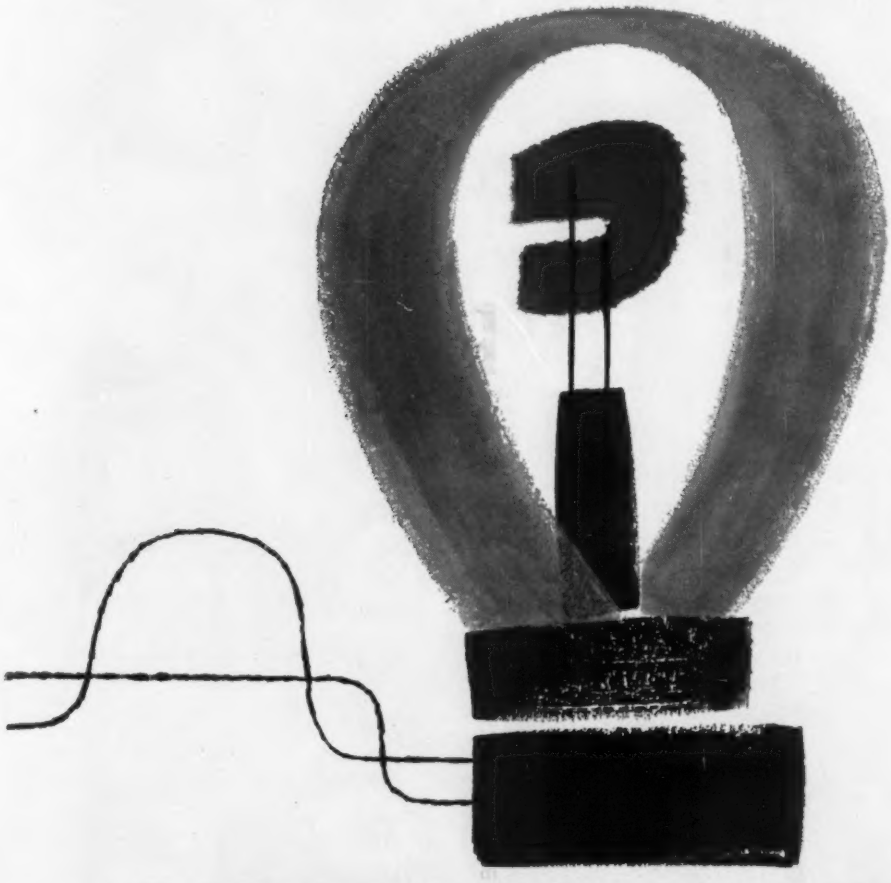
Although a duplicate of a previous order, this 12,000-kva Pennsylvania Furnace Transformer differs from its "twin" in one detail. Its motor-driven tap changer is housed in separate compartments, to facilitate periodic inspection and maintenance. The mechanism includes a provision for emergency hand operation.

PENNSYLVANIA FURNACE TRANSFORMERS

pt

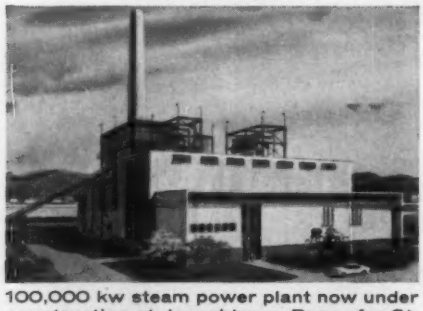
McGRAW EDISON

call KE for plant expansion or new facilities



INGENUITY

has made KE a major builder of dependable power facilities



100,000 kw steam power plant now under construction at Josephtown, Penn., for St. Joseph Lead Company, a large American lead and zinc producer. The new turbo-generator plant is being designed and built by KE's thermal power plant specialists.

Since installation, no unscheduled outages have occurred in power plants built by Kaiser Engineers. On the contrary, in numerous cases KE-built plants have fed power into neighboring systems temporarily "down."

Preventing outages, building in reliability that insures against service interruption—these are benefits of engineering and construction ingenuity as surely as are low initial cost, fast completion, and low operating cost.

Experienced KE engineers can take your power plant idea from conversation through completion; conduct every phase from economic analysis through operator training. Whether your future power needs are thermal or nuclear, call KE.

KAISER ENGINEERS engineers—contractors

Contracting since 1914

Division of Henry J. Kaiser Company • Oakland 12, California • New York, Pittsburgh, Washington, D.C., Buenos Aires, Calcutta, Dusseldorf, Montreal, Rio de Janeiro, Sydney, Tokyo

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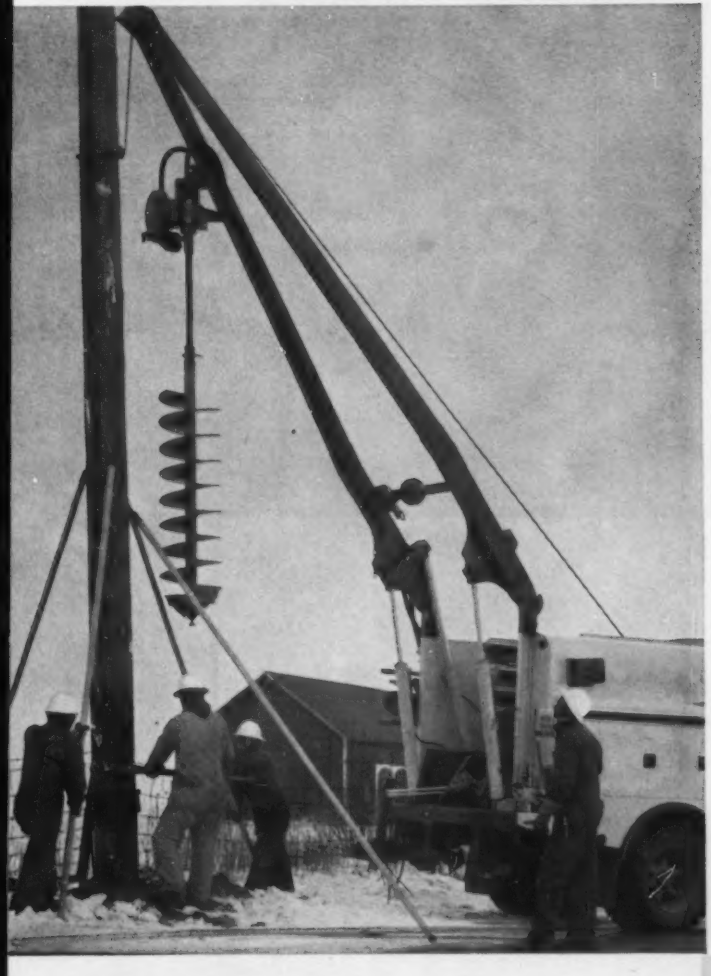


Meet the derrick that has more power in the low ranges

Holan Series 6800 Derrick gets extra power from extra cylinders

As you can see, some people have already met the new Holan Series 6800 Power Derrick—met it, used it and liked it!

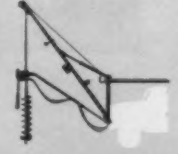
They like the two sets of cylinders that give more power in the low ranges—more power for lifting, more power for forcing diggers into hard ground. They like the exclusive dial load-indicator to quickly show capacity in any position. They like Holan's lighter-but-stronger fabricated, rectangular side legs. And they like live-boom action with a single-drum winch.

The 6800 handles 8,000 pounds . . . sets 65-foot poles . . . body-loads 4,000 pounds . . . and lifts 2,000 pounds when only 5½ feet from the ground. To learn some more facts, meet the man who can tell you all about it, a Holan Field Representative. Call or write.

OTHER EQUIPMENT IN THE PHOTO:

Series 4095 Hydraulic Jacks, self-stowing, move to full extension in 8 seconds, return to stowed position in 6 seconds. 14,000-pound capacity.

Body is CMC-164. All Holan bodies are made of hi-tensile, rust-resistant steel 20 to 25% lighter than ordinary steels.



Series 4401-H Hydraulic Earth Borer digs holes 8" to 20" wide, 8 feet deep. Power feed attachment in photo uses weight and power of derrick to force digger into ground. Note that hydraulic lines from digger in photo run along side leg instead of hanging loose.

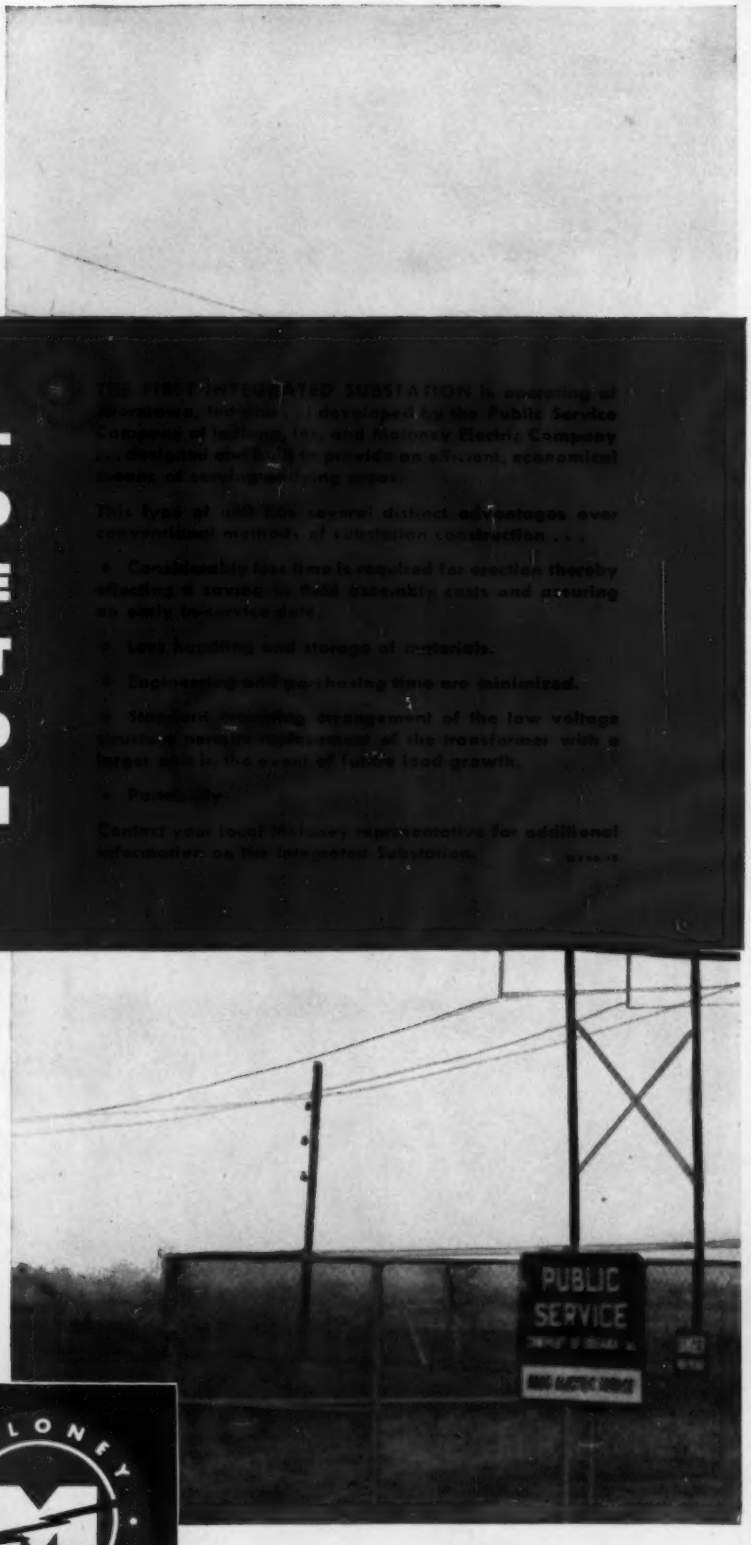
J.H. HOLAN® CORPORATION

4100 WEST 150TH STREET
CLEVELAND 35, OHIO

OTHER PLANTS: **HOLAN CORPORATION OF GEORGIA,** Griffin, Ga.
J. H. HOLAN CORPORATION, PHOENIX DIV., Arizona
BRANTFORD-HOLAN LIMITED, Brantford, Ontario

THE NAME THAT MEANS WORK SIMPLIFICATION

PRE-ASSEMBLED DOUBLE CIRCUIT INTEGRATED SUBSTATION

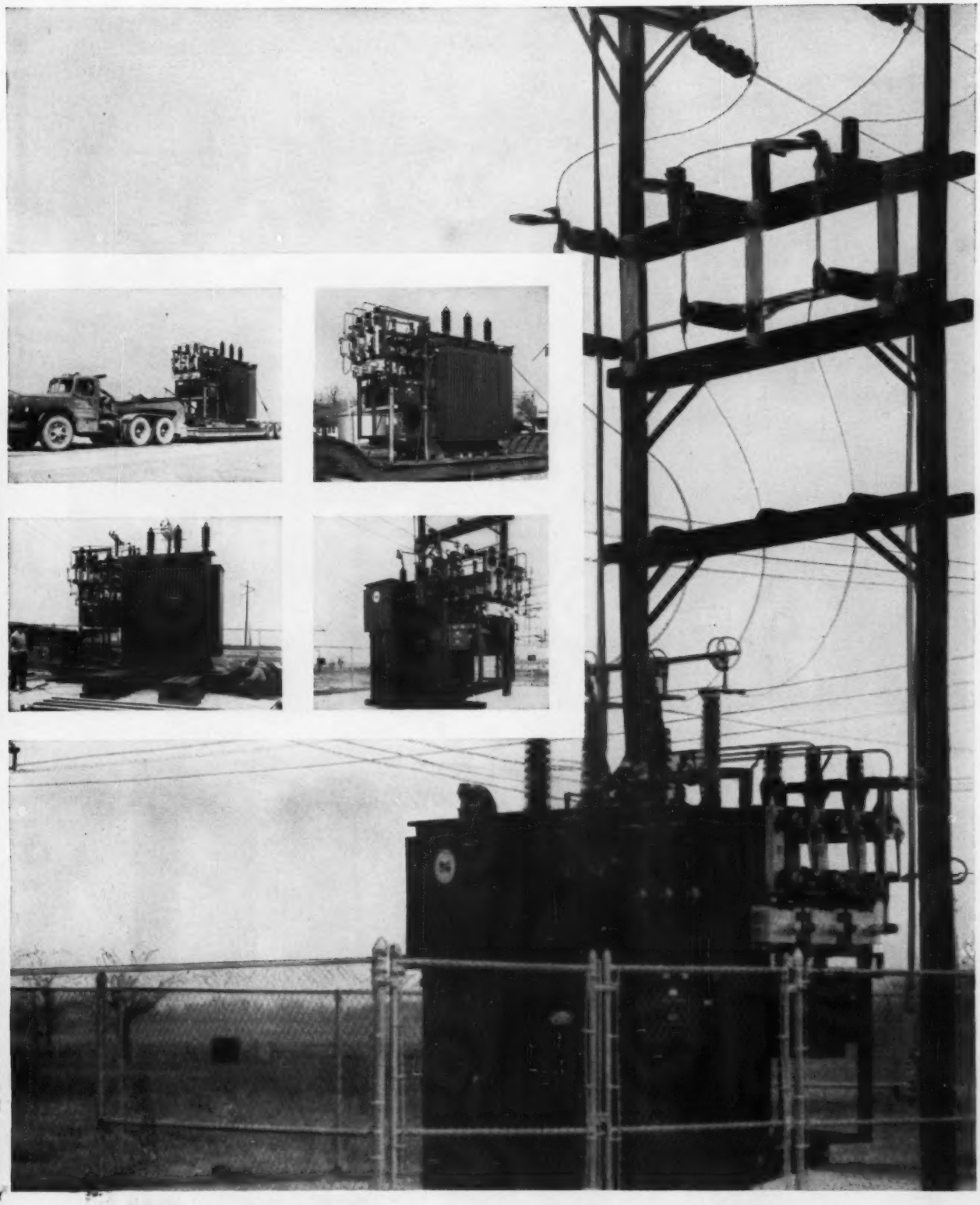


MOLONEY ELECTRIC

MOLONEY

Manufacturers of

SALES OFFICES IN ALL PRINCIPAL CITIES



E L E C T R I C C O M P A N Y

Transformers for Utilities, Industry, and Electronic Applications

FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

The all new AMP UTILI-SPLICE offers top quality, speed and reliability

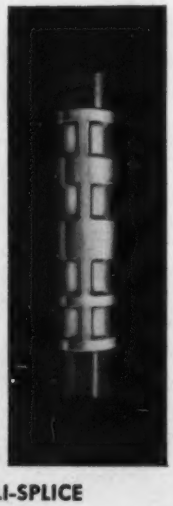
The A-MP UTILI-SPLICE features advancements based on over ten years of aluminum termination experience.

The entire UTILI-SPLICE surface is prepared for maximum conductivity and corrosion resistance by a special AMP plating process. Pre-inhibited with a highly effective non-flow compound, each UTILI-SPLICE connection is sealed against the elements. The inhibitor's conductive nickel particles lay bare pure metal of the conductor during compression. The special plating-inhibitor teamwork provides superior life characteristics.

UTILI-SPLICE lengths are in proportion to the wire cross section area. Thus maximum contact area and heat dissipation are obtained at a minimum of cost.

UTILI-SPLICE wire-stops assure precise insertion depth. Wire sizes range from 8 through 1/0 . . . aluminum or copper or combination, solid, stranded or ACSR . . . all clearly marked along with crimp locators.

AMP developed companion units—light weight A-MP hydraulic and mechanical tools . . . provide fast, accurate optimum connections.



When the linesman steps up the ladder with the new Step-Down UTILI-SPLICE and matching tool, you get permanent, high quality splices at low cost.

American Pamcor, Inc.

api AMERICAN PAMCOR INC.

GENERAL OFFICES: 181 HILLCREST AVE., HAVERTOWN, PA.

EXCLUSIVE DISTRIBUTOR FOR AMP PRODUCTS TO THE UTILITY INDUSTRY

Original "straight-through" design

This "look" on a pole means KPF

There's no mistaking the clean, pleasing pole top appearance of KPF switches—the original "straight-through" design. This design means lower cost, trouble-free service, no lubrication, virtually no maintenance. Installation may be made in the air or on the ground, on hot or dead lines, with phase units in horizontal, triangular or vertical array. Installation time is half that normally needed; no extra dead end insulators or heavy extra mounting structures are required.

Test install a KPF switch on your system this month.

KPF ELECTRIC COMPANY
Dept. E, 1624 E. Alpine Avenue
Stockton 5, California

Federal Pacific Metal-Clad Switchgear is made compact...rugged... and in increasing numbers!

Federal Pacific Metal-Clad Switchgear does the job—it's proven by the growing list of installations across the United States and abroad. Most important, Federal Pacific does it with stronger materials, fewer parts, most modern design, and complete safety to operating personnel.

It's rugged...it's safe...it's easy to maintain...it's accepted!

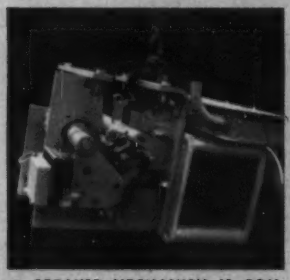
For the full Federal Pacific Metal-Clad Switchgear story call your Federal Pacific engineer or write for Catalog No. 3-440, Federal Pacific Electric Company, Newark, New Jersey.

FEDERAL PACIFIC

FEDERAL FPE PACIFIC

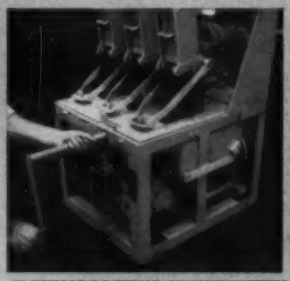
Better Products to Distribute and Control Electricity

FEDERAL PACIFIC METAL-CLAD SWITCHGEAR OFFERS UTILITIES THESE SPECIFIC ADVANTAGES:

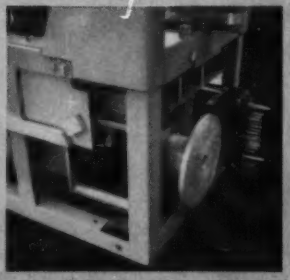


• **BREAKER MECHANISM IS COMPLETELY SELF-CONTAINED**—Attached to frame by *only four bolts*. No bearings or shafts are in contact with frame. Breaker mechanism can be removed for inspection and maintenance as a unit—simply and quickly.

• **PRIMARY DISCONNECTS ASSEMBLY MOUNTS ON BREAKER AS A UNIT**—Complete six stud bushing sub-assembly mounted directly on breaker facilitates inspection and service.



• **SIMPLE RACKING-IN MECHANISM**—Only two moving parts...provides positive safety inter-locking in any position.



• **CLOSING SOLENOID MAINTAINS TORQUE TO END OF STROKE.** Plunger disc gives solenoid additional pull at the end of the stroke when most needed...to compress closing springs and make positive contact.

The Electrical Week

FUTURE NEWS ▶ **Look for more power pools** to make the best possible use of available generating capacity and to insure adequate reserves.

LATE NEWS ▶ **AEC creates an office of hearing examiner** to conduct hearings into license petitions for power reactors and other facilities. First examiner is S. W. Jensch, FPC attorney; he will be responsible directly to the commissioners. Up to now, hearings have been held by an examiner borrowed from the Federal Communications Commission.

NEMA is protesting a ruling of the Commissioner of Internal Revenue to put a 10% excise tax on all self-contained room air conditioners. At present this tax applies only to units rated less than 1 hp.

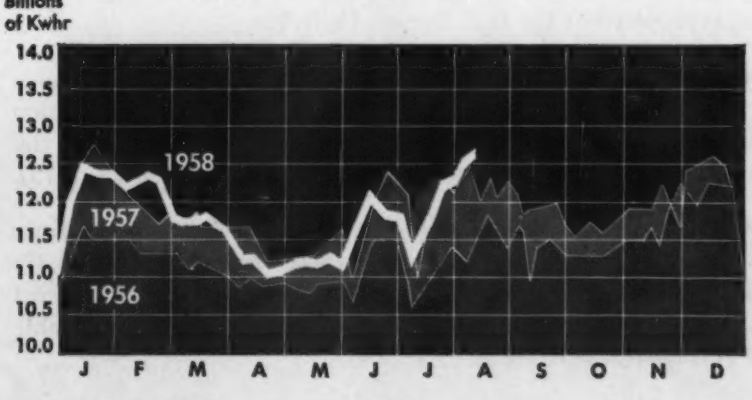
Delays in Soviet nuclear and hydro power were hinted at recently by Premier Khrushchev in a speech at the dedication of the world's largest (2.3 Mw) hydro station at Kuibshev. Principal reasons: lack of sufficient capital, and the long time required for building hydro and A-power projects. Khrushchev said "We must win time" by concentrating on quickly built thermal stations to provide the necessary power to outstrip U. S. in the economic cold war.

Mechanical tests will be run for a year on Ohio Edison's one-mile test section of 345-kv line, consisting of two 954-MCM conductors per phase and supported by 82-ft high waist-type towers.

Federal Pacific Electric gets $2,690,365 contract from Power Authority of the State of New York to supply 34 115-kv, 10,000-Mva and 24 230-kv, 20,000-Mva oil circuit breakers for Niagara switchyard of Niagara Power Project. The Authority also awards $122,875 contract to General Electric for 15-kv metalclad switchgear and appurtenances for the switchyard.

Electric output hits record for second consecutive week. See below.

POWER OUTPUT—Up 5.3% (Week ending August 9), Kwhr 12,707,000,000



Per Cent Change From Previous Year

	July 26	Aug 2	Aug 9
Total U.S.	+0.6	+1.2	+5.3
New Eng.	+1.4	+2.5	+5.1
Mid. Atlantic..	−0.6	+3.9	+5.5
Cent. Ind.	−3.0	−3.1	+2.7
West Cent.....	0.0	−7.2	+7.7
Southeast	+3.7	+6.3	+7.0
South Cent. ...	+8.6	+5.9	+14.8
Rocky Mount...	+8.1	+5.6	+4.7
Pacific			
NW	−13.7	−11.9	−10.9
SW	+2.6	+3.0	+4.6

Seasonally Adjusted Index 237.4

Week Ago 235.1 Year Ago 225.3

Source: Edison Electric Institute

A TWO-MINUTE PREVIEW OF THIS ISSUE

EVENTS ▶ **U. S. Comptroller General has suspended his recent ruling** to bar Federal loans to rural electric co-ops, which use 2% government money to compete with private power **(p 60).**

Has there been a deterioration in the professional quality of AIEE's summer meetings? Not according to AIEE president L. F. Hickernell, who answers questions raised by a July 14 EW editorial **(p 63).**

SPECIAL REPORT: LINE CONSTRUCTION ▶ **You'll save money on certain construction jobs** using a helicopter "skyhook". That's what Southern California Edison Co did. The utility's carefully analyzed results show: Average copter-delivered load was 9.1 tons per flight hour over a 3.6 mile depot-to-site distance. Actual costs ran $6.80 per ton mile. Southern Cal also found it could transport and set 15 40-ft poles in rough country in one hour, saving about $2,000 over conventional setting methods **(p 66).**

Rerouting a 12-kv line through an almost inaccessible canyon posed a tough problem for Pacific Gas & Electric. Hand and block-and-tackle methods seemed the only solution until a Sikorsky S-58 came on the scene. The versatile copter transported and set some 62 poles weighing over ½ ton each in 8½ hours flight time—a job that would have taken a seven-man crew 60 working days **(p 69).**

Few utilities could keep a cargo crane helicopter busy enough to warrant purchase, but air charter service is available. The two most likely candidates for cargo duty are the Sikorsky S-58 and Vertol 44 helicopters. Both are in the $300,000 range. They cruise at about 100 mph and have a range of 200 miles. Lifting capacity varies with altitude and temperature, but is roughly 4,000 lbs—enough to transport fully framed poles and light tower sections. But heavy equipment is still out of the civil helicopter picture. There are military copters flying today, however, which could handle a payload of six to eight tons if released to the civil market **(p 70).**

Conventional line construction techniques have undergone big changes during the post war period. Higher towers and the corona problem have been partly responsible for these changes. Mechanized equipment is the solution to many of the new problems which have arisen, as reported by the L. E. Meyers Co **(p 70).**

High speed construction equipment and better scheduling reduces line construction costs for Idaho Power Co. With steel erection handled in two phases, each with its own crew and equipment, the utility's workmen are able to specialize to reach peak efficiency **(p 73).**

Think you could put up a 76-mile 230-kv steel H-frame line for little more than the cost of wood-pole construction? Georgia Power Co did just that, using mechanized equipment to erect tubular steel structures. Cost was $24,300 per mile—12% more than a comparable wood H-frame line **(p 78).**

GENERATION ▶ **Much of Canada's vast hydro potential** lies in the Rocky Mountain Trench of British Columbia. The Trench, an 800-mile valley running along the western base of the mountains, could yield 3,000 Mw of hydroelectric power **(p 116).**

BUSINESS ▶ **The recession is over and recovery has begun.** The turn-around was partially screened by events in the Middle East, but there's no question that the recovery is already starting to pick up momentum. Personal income has held up remarkably well, and this month should break through its pre-recession high. But profits have really taken a beating—off by about a third **(p 109).**

MANAGEMENT ▶ **Customer data at a glance** is the big feature of the "tub of records" now in use by Central Power & Light Co. This new accounting system saves posting time and office space **(p 88).**

PUBLIC RELATIONS ▶ **When Panorama TV goes visiting in Denver,** Public Service Co of Colorado chalks up bonus points in its public relations books. PS Co's award-winning documentary TV series relays the pulsebeat of the community to 175,000 viewers. The stars of the show? Skid row, the parole system, hospitals, museums and industry. The weekly program costs the utility $750 to produce **(p 90).**

SELLING ▶ **Everything from electric baseboard heating** to an electric lawnmower will keep Gold Medallion Homeowners living electrically in a new-home development in Illinois. And at a bargain price too; homes sell for a low $15,400 **(p 113).** . . . Electricity proved so advantageous to an asphalt producer that he returned an expensive oil fired heater to the manufacturer, replacing it with an electric heater at a saving of 34% on overall operating costs **(p 114).**

MANUFACTURERS ▶ **A condenser containing 5,460 tubes,** each 24-ft long, has been shipped intact **(p 93)** . . . Eight large horizontal air preheaters are being installed in Bergen generating station **(p 93)** . . . Six 17-ft high cascade potential transformers have been made for 345-kv service **(p 95)** . . . A 20,500-kw gas turbine has been developed for peaking service **(p 95)** . . . Two 64,600-kw waterwheel generators have been ordered for Southern California Edison's Mammoth Pool plant **(p 95).**

NEW EQUIPMENT ▶ **W-hr demand meter** for use in locations where load growth is anticipated has dual range feature . . . Watertight, fully insulated underground connectors join two to 18 cables . . . W-hr meter test table accommodates two meters simultaneously . . . A new remote control system is available for unattended power stations **(p 98).**

PEOPLE ▶ **New chief electrical engineers for two utilities** are Bartow Van Ness, Jr, Pennsylvania Power & Light Co, and J. W. Graff, Alabama Power Co . . . George W. Muschamp has been elected vice president-engineering and C. B. Wilson has been made vice president-marketing for the Industrial Products Group, Minneapolis-Honeywell **(p 118).**

The fuel cell is attractive because it holds forth the promise of delivering electric power at a greater efficiency than that permitted by the present Carnot-cycle limited power station. This source of power escapes the Carnot-cycle limitations because it never converts heat directly into work.—**D. L. Douglas and H. A. Liebhafsky, General Electric Review, July 1958.**

TECHNICAL NOTES

External faults can saturate one or more of the main current transformers to such a degree that a false differential current can flow in the operating coil of a transformer differential relay.

Almost all magnetic materials show deterioration in their magnetic properties when exposed to nuclear reactor radiation.

Position of furniture has an important effect upon performance and efficiency of under-floor electric heating systems. For furniture which rests solidly on the floor it is better to arrange it across the run of the heating cables. This arrangement spreads the effective screening over a large number of wires rather than blotting out completely the run of a couple of wires.

Earlier and more widespread distribution of computer output data can be obtained by typing the output directly on vellum for easy, rapid reproduction of the results without intermediate clerical and typing operations.

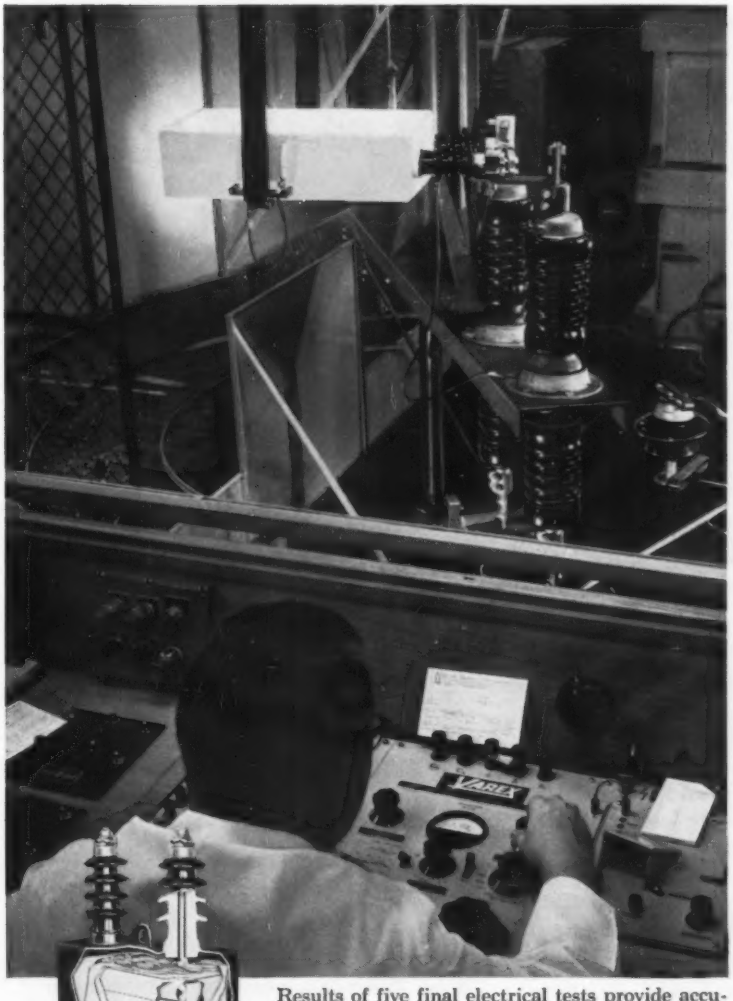
FROM EDITORS IN THE FIELD

Public Service Co of Colorado is remodeling 50 of its largest trucks by switching the exhaust pipes from the right to the left side. Exhaust fumes no longer will be expelled into the paths of sidewalk pedestrians.

Future nuclear power plants may provide industrial radiation processing services as by-product. Atomics International, under AEC contract, is exploring feasibility of using radioactive sodium coolant from the 75-Mw(e) Hallam, Nebraska sodium-graphite nuclear power plant as high-level radiation source for this purpose. The study includes a preliminary design for the processing plant.

VAREX Tests Simulate 20 Years of Service in Five Minutes

THEY GIVE THE ANSWERS ON PERFORMANCE CHARACTERISTICS BEFORE O-B CAPACITORS ARE INSTALLED



Results of five final electrical tests provide accurate measurement of how Varex unit will perform.

Interested in knowing what will happen to this capacitor under a lightning impulse, or switching surge? Want to know whether you're getting the kilovars you pay for? If it should be necessary to discharge the unit, will it discharge during the prescribed period?

We're just as anxious as you are to know the answers. And we don't want to wait 20 years to get them. They're available on every Varex unit as soon as it's finished.

Every Varex capacitor goes to this final electrical test area -- the conveyor system is set up so it can't go anywhere else -- and it receives five tests: 1) line-to-line overvoltage (dc); 2) check on discharge resistors; 3) terminals-to-case overvoltage; 4) capacitance measurement under rated name plate ac voltage; 5) loss measurement.

In all these tests we go well beyond NEMA requirements so that we can be sure the capacitor that passes them will have minimum losses, maximum protection against switching surges and lightning impulses, ability to withstand heat storms and low temperatures, and the ability to deliver the right KVAR output at rated voltage.

In five minutes these tests will tell facts about performance that might take 20 years of service to find out.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

Every VAREX Capacitor Gets this Two-Way Protection

1

DURABLE EPOXY ON THE CASE

Epoxy-resin paint used on Varex is most durable finish commercially available for this class of material.

2

PACKAGING PROTECTION RIGHT UP TO THE POLE TOP

Extra-heavy carton has gross rating of 160 pounds, more than 40 pounds above heaviest 50-KVAR unit.

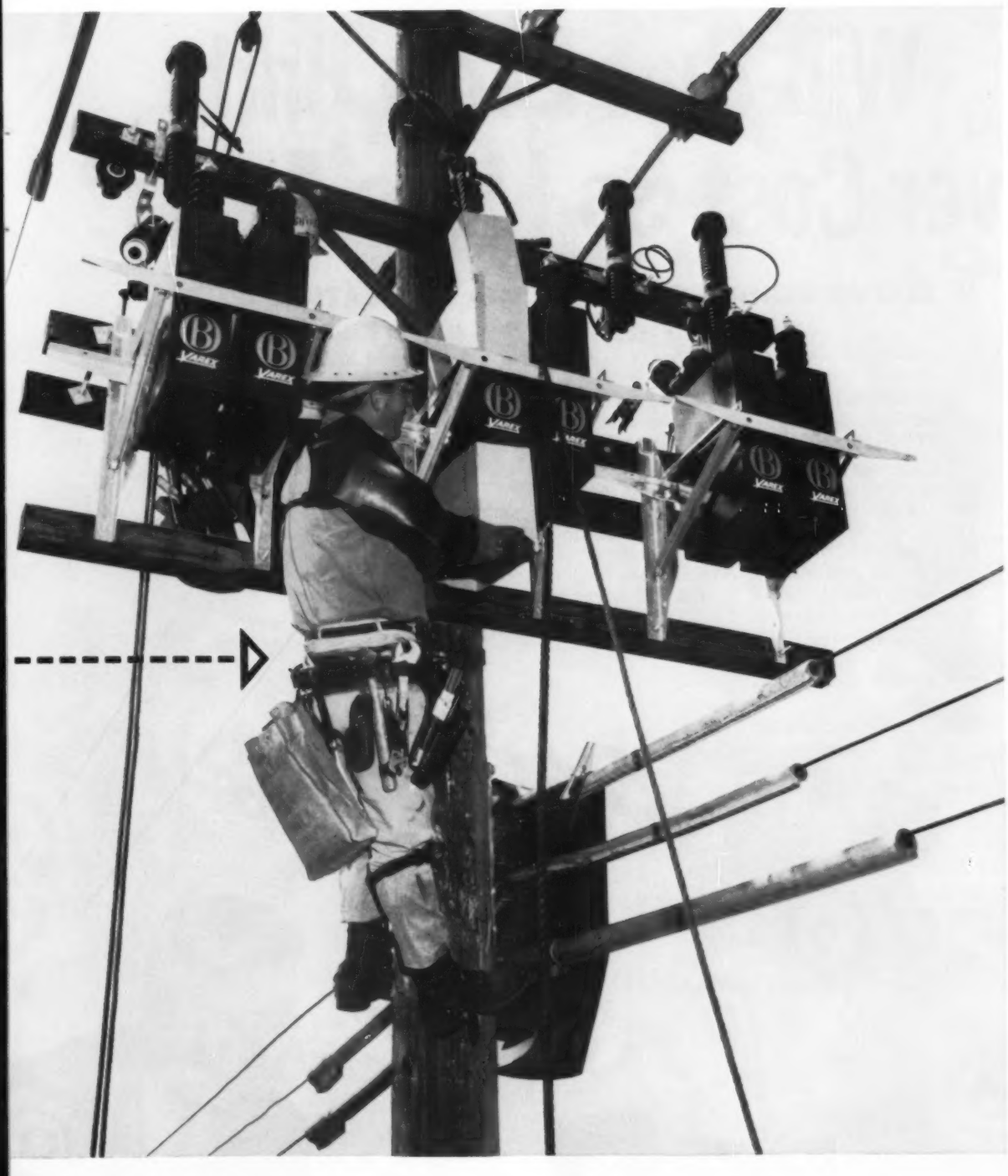
At the end of the assembly line, each Varex unit is packaged in a carton having a gross weight rating of 160 pounds. Inside the carton are a special split liner that fits around the capacitor case, two liners that fit over the bushings, and heavy spacers that reinforce the carton and give extra protection at the narrow sides of the unit.

All this protection can be left intact until arrival at the installation site. Then the outer carton is removed but the inner liner is left in place, and can be left in place until the unit is bolted in place.

But the real protection is just beginning. For underneath the carton liner is special epoxy-resin finish used on all Varex cases. This is the new finish — available only on Varex—that has been proved superior to other resin base paints on corrosion resistance, abrasion resistance, flexibility and adhesion.

You get this two-way protection with every Varex capacitor — 1) complete protection against weather after the unit is installed; 2) protection against damage in handling right up to the pole top.

OHIO BRASS COMPANY, MANSFIELD, OHIO



Ohio Brass

Will that Extra Unit Ever Cost So Little Again?

IF YOU'RE GOING TO NEED EXTRA INSULATION—EVER— NOW IS THE TIME TO PUT IT IN

Remember after World War II when $10,000 seemed like a big price for a five-room house? That's the house that will cost $20,000 today.

During the same period, the price of a primary deadend insulator has increased, too. But the cost of the insulator is only a fraction of the cost of putting it in the air. Changing a deadend from one to two insulators, or from two to three, costs much more than the insulator. And certainly, it will cost even more ten years from now.

Nearly everyone is restudying future distribution voltage requirements, and deciding now which distribution deadend will provide adequate insulation for tomorrow's voltages. They know system voltages are going higher, much higher.

The point is plain. If you're ever going to need extra insulation in your distribution deadends, now is the time to install it . . . as you rebuild existing lines and build new ones.

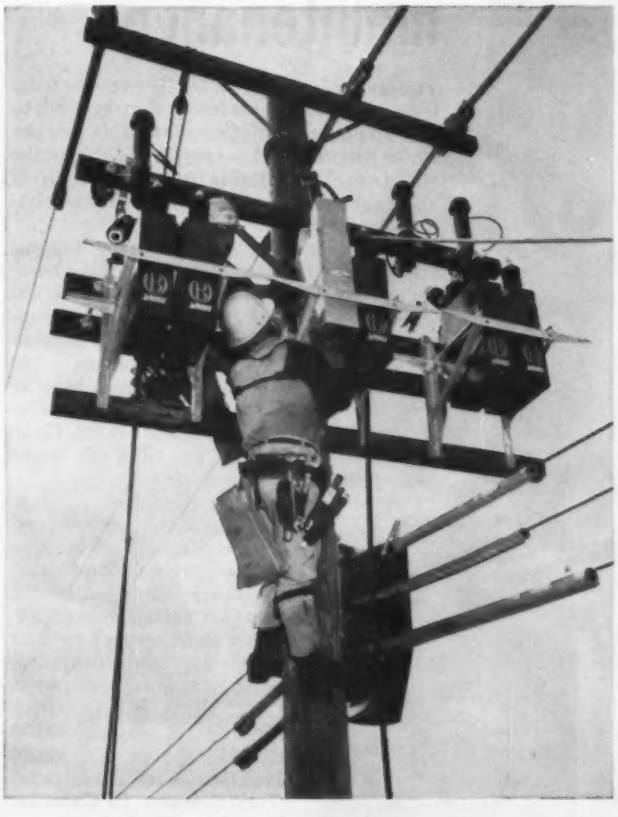
That extra insulator will never cost so little again!

OHIO BRASS COMPANY, MANSFIELD, OHIO

4882-H

Up to 12 Inches Extra Clearance at Pole Top

Provided by Low Height of VAREX Capacitor, and Central Lifting Eye



Low height of Varex, plus inches saved by lifting eye location, provides extra clearance, often eliminates need to move primary.

Just a few inches can make a critical difference when capacitors are being installed on distribution lines. To get the necessary clearance for moving the capacitors under the primary and into the rack, it's often necessary to move the primary with hot sticks . . . with a considerable loss in time.

Varex capacitors give you as much as 12 extra inches of clearance at the pole top. Often they can mean the difference between merely covering the primary and the need to move it completely out of the way.

Here's where the difference comes from.

First, Varex 50-KVAR capacitors are as much as five inches lower than other brands.

Second, the Varex lifting eye is centrally located between the bushings. There's no need to put a complicated sling arrangement around the unit. A hook, clevis, shackle, or whatever attaching device you prefer, can go right down between the bushings. The result: a gain of another six to eight inches in clearance.

It's obvious that designers of Varex capacitors understood your installation problems. Everything has been done to make installation fast and easy.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

Central lifting eye lets capacitor hang straight, making it easy to maneuver.

4873-H

News about

B.F.Goodrich Chemical *raw materials*

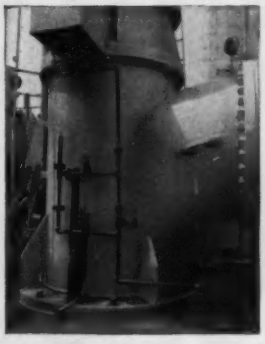
AT FLORIDA POWER & LIGHT'S CUTLER GENERATING STATION

How pipe of Geon helps cut maintenance

The large photo shows 3½" pipe made from Geon rigid vinyl material that is used to feed an aqueous solution of chlorine into sea water just ahead of bar screens at the intake structure. The chlorine prevents buildup of algae in condenser tubes and in the circulating water system.

The smaller photo shows more pipe of Geon circulating salt water to cool the bearings of circulating water pumps. Geon is not affected either by salt water or most chemicals—which proves its value in still another part of this large generating station.

Geon is used to pipe the acid bearing (H_2SO_4) wash-down water from the boiler waste hopper to the discharge canal. Geon piping is used also for pumping salt water to the soot disposal collectors.



Geon pipe and conduit also provide high impact and tensile strength. Both are lightweight, easy to install. They are examples of the way that versatile Geon provides the key to new and improved products or applications. For information, write Dept. LR-9, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON polyvinyl materials • HYCAR American rubber and latex
GOOD-RITE chemicals and plasticizers • HARMON colors

SANGAMO CLASS 200 P2S **ACCURATE·ECONOMICAL**

A CLASS 200 POLYPHASE METER

in your *standard singlephase cover*

IMPROVED LOAD CHARACTERISTICS. P2S Class 200 Meters start at ¼% of rated load and provide accurate measurement to 666⅔% of rated load. This means that you can *accurately measure loads from 18 to 96,000 watts* with Type P2S Class 200 Meters.

GREATER OPERATING ECONOMIES. One meter, the 240 volt P2, can be applied to 120/208, 240/416 and 277/480 volt network systems, also to 3-wire 3-phase, and 3-wire singlephase circuits *without special calibration.* Accurate registration is obtained from 42% to 125% of rated voltage.

All Type P2 Polyphase Meters have been substantially reduced in height. The cover, interchangeable with the singlephase metal base socket meter cover used for the past twenty years, can be readily replaced from your existing cover stocks.

STABILITY. P2 Meters give sustained accuracy because of Sangamo's precise factory calibration... skillful design... careful selection of materials ...and rigid control of manufacturing processes.

SLOW SPEED. The advantages of slow disk speeds, proved so well in the Sangamo J2 Meter, have been incorporated to an even greater degree in P2 Meters. Reduced current and potential damping provides *greater inherent accuracy.*

* * *

The complete line of LIFETIME GUARANTEED Sangamo Type P2 Meters will handle all polyphase measurements.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

JM58-4

Here are the **NEW GUYS** they're all talking about!

Men who are using the new Copperweld* Type M Guy Strand are already praising its two major features: Economy and Convenience. Through research and new production techniques, it is possible to market Type M at new low prices, yet retain the high quality standards of Copperweld. Consequently, your initial investment is minimized. As for yearly maintenance, it is a long-established fact that there is practically no upkeep with Copperweld.

Pliable and easy to handle, Type M Guy Strand can be readily bent, served, moused or clamped. The thick, ductile copper sheath of each wire will not crack, flake or peel because it is inseparably molten-welded to the steel core.

Write us today for complete details. Our field engineers will be glad to explain the advantages of Type M to you.

Trade Mark

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

New Copperweld TRADE MARK
TYPE **M** GUY STRAND

2.2M 4M 6M 8M 10M 12.5M 16M

"Almost every day we find new jobs for 2-way radio"

SAYS HARRY M. LEWIS, SUPT. OF COMMUNICATIONS, CALIFORNIA OREGON POWER COMPANY

Over canyons, streams and mountains, as well as in heavily populated urban areas, Motorola 2-way radio is helping The California Oregon Power Company construct and maintain electric service *faster, more efficiently* and at *less cost.*

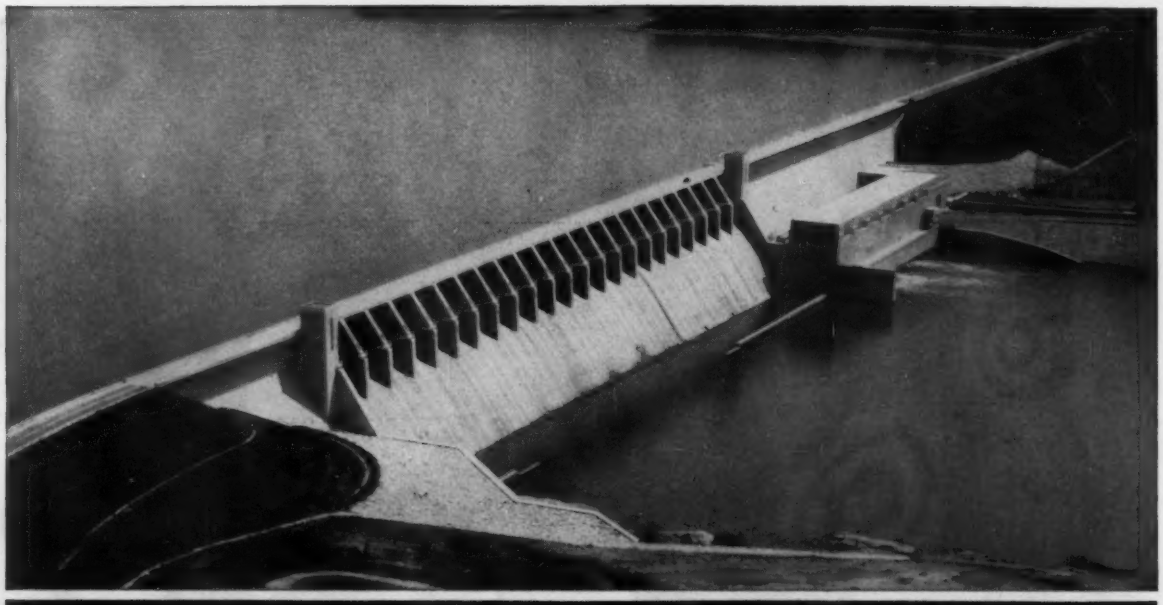
The giant radio network of 16 base stations, 90 mobile sets, and 31 HANDIE-TALKIE® portable radiophones is used by practically every outside working team.

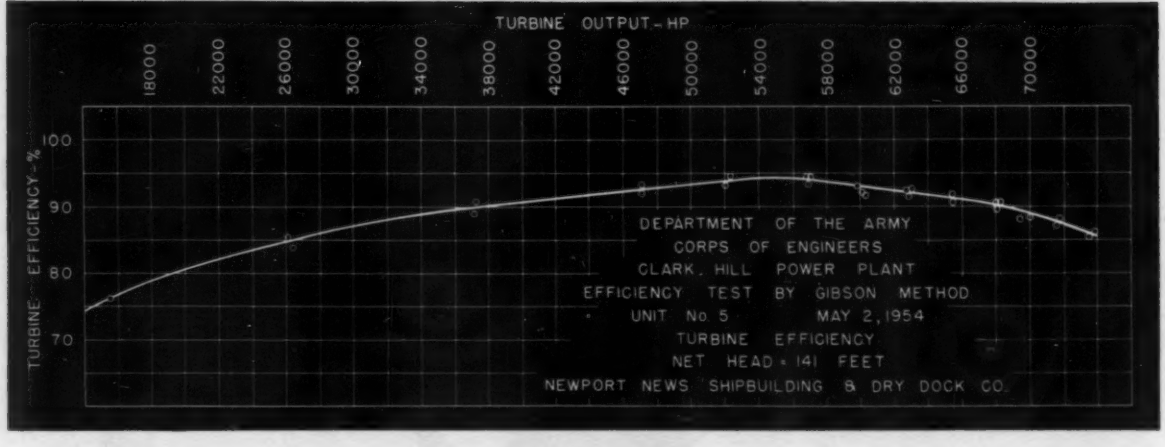
Superintendents and other key men are freed from their desks—can be reached on the job or in their cars. Survey parties and wire stringing crews use HANDIE-TALKIE portables to communicate, spanning long reaches faster and better—saving *hundreds* of dollars every day. Repair crews are more productive—get lines back in operation faster, keeping customers better satisfied. Line patrols in tractors and helicopters work safer and more efficiently with radio.

Whatever the job—Motorola 2-way radio can help you speed it at less cost. Specify Motorola for the most dependable, uninterrupted mobile communications. For a Motorola communications specialist on Power Utility problems—write, wire, or telephone.

MOTOROLA *2-WAY RADIO*

MOTOROLA COMMUNICATIONS & ELECTRONICS, INC. • A Subsidiary of Motorola, Inc. • 4501 Augusta Blvd. • Chicago 51, Illinois





Maximum efficiency of 94.1%

Reflects advanced practices at Newport News

THE GRAPH shows performance of a 55,000 horsepower turbine, one of seven such units built by Newport News for the Clark Hill Power Plant (see photo).

Shape of the curve is typical . . . not exceptional . . . for Newport News turbine performance. Regular, uniform, showing no-cut-off at full load, it indicates consistent delivery and stable operation.

And especially, experience in design and model testing.

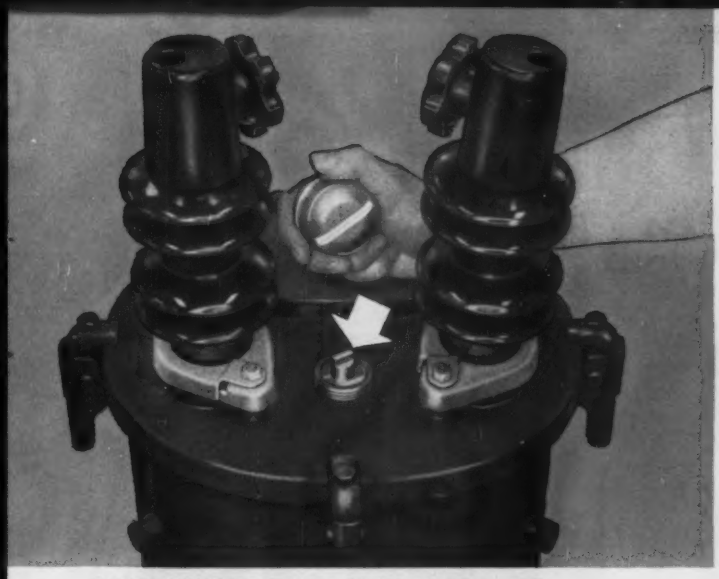
At Newport News, turbine runners are continually being designed and redesigned for improvements in performance. And often upon receiving a contract for turbines, a model setting is built and complete tests made. So far, Newport News has filled turbine contracts with an aggregate rated output in excess of 7,000,000 horsepower.

Penstocks, spiral casings, valves, pumps, rack rakes and other essentials are also designed and built by Newport News. Our illustrated booklet, "WATER POWER EQUIPMENT," will be sent to you upon request.

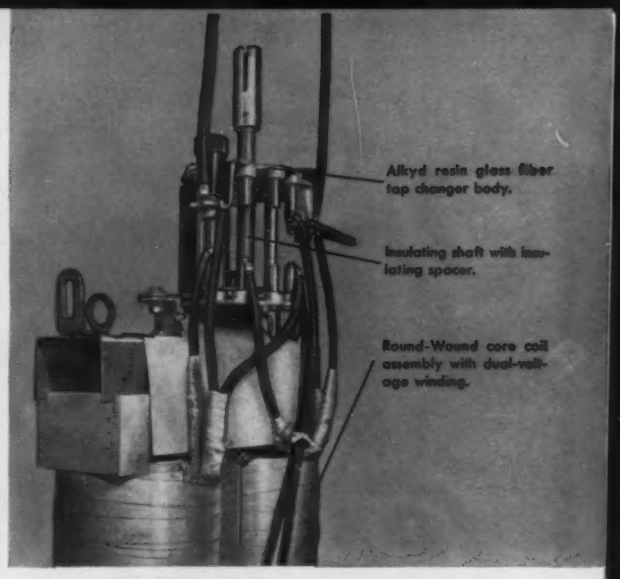
Engineers . . . Desirable positions available at Newport News for Designers and Engineers in many categories. Address inquiries to Employment Manager.

Newport News

Shipbuilding and Dry Dock Company
Newport News, Virginia



COVER-MOUNTED series-multiple switch control for L-M dual-voltage transformers. The aluminum cap is simply unscrewed by hand and turned over to operate the switch. The oilproof and weatherproof seal is completely independent of the cap. Voltage is clearly indicated under the cap. (Arrow)


Alkyd resin glass fiber tap changer body.
Insulating shaft with insulating spacer.
Round-Wound core coil assembly with dual-voltage winding.

L-M ROUND-WOUND dual-voltage core-coil assembly, showing the direct motion-transmission from the cover-mounted control through self-aligning stainless-steel shaft. The heavy-duty snap switch is built with the same time-proved components used in the trouble-free L-M tap changer.

L-M's Dual-Voltage Transformers Offer Cover-Mounted Switch, Round-Wound® Design

Cover-mounting provides direct control, better rigidity, with less danger of oil leakage and accidental damage. Round-Wound construction assures best possible performance.

By **DENNIS A. MANNING**
Manager, Transformer Sales & Service
Line Material Industries

L-M dual-voltage transformers offer some appreciable advantages to companies in the process of changing over to higher distribution voltages. When the change is definitely planned, L-M dual-voltage Round-Wounds make it possible to change the transformer from a lower voltage to a higher one simply by unscrewing the cap at the top and snapping the switch.

This reduces labor in cutting over; there is less down time, resulting in increased revenue to the utility and better service to the customer—certainly important advantages.

Some Disadvantages

In considering the installation of dual-voltage transformers, some disadvantages should be recognized. First, the cost of the units is higher than the cost of a standard transformer. Second, losses are at least those of the higher-voltage winding. If the transformer is to be operated at the lower voltage for a long time, these higher losses may be a factor worth considering.

However, where the change is contemplated within a reasonable length of time, reduced labor costs and elimination of down time may well be offsetting factors.

Many Advantages of Cover-Mounting

The cover-mounted L-M switch is an excellent feature. Vertical construction makes for excellent mechanical design. Motion is transmitted directly to the switch by a self-aligning shaft. This shaft is stainless steel, which prevents corrosion that could cause binding.

With the switch control in the cover, there is less danger of tampering, less danger of accidental damage, and less interference when mounting the transformer. The switch cap is more easily accessible to the lineman than a switch on the side of the tank.

Clear, Positive Indication

Only the voltage for which the switch is in position is seen on the top of the switch, so there is no possibility of confusion. For safety there are double stops, one internal, one external. It is not necessary to remove the tank cover to check switch position. Should the weatherproof cap be misplaced, no material damage will result, and switch is easily operated with a small wrench.

Let Us Supply Data, Details

L-M Round-Wound dual-rating transformers are available in various combinations from 2400 to 14,400 volts through 100 kva. Let us supply detailed information both on the design and on the ratings and sizes available. Ask the L-M Field Engineer—or if you prefer, write me at Line Material Industries, Transformer Division, Zanesville, Ohio.

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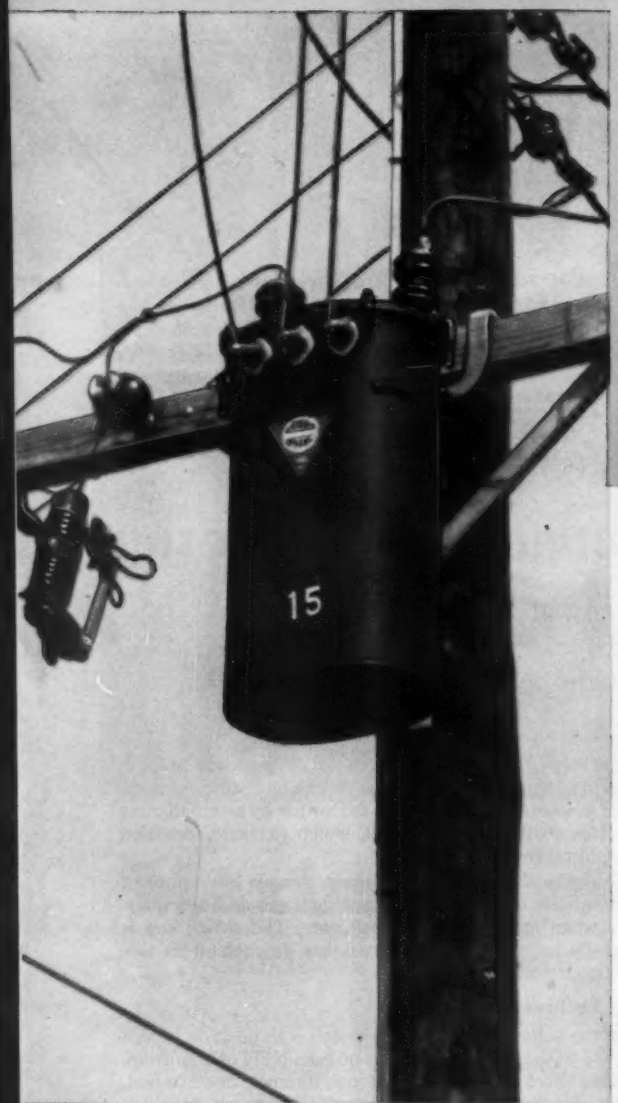
LINE MATERIAL Industries Distribution Transformers
McGRAW-EDISON COMPANY

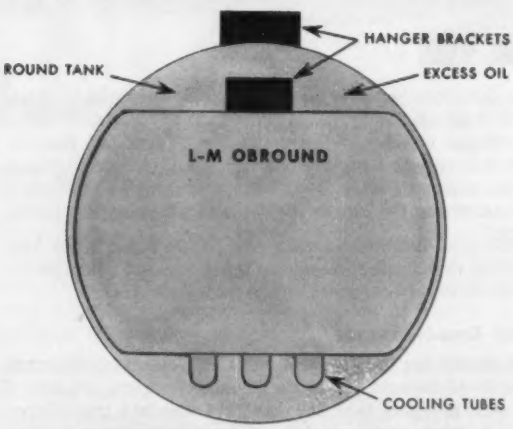
DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS
POWER SWITCHING EQUIPMENT • PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING
LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

McGRAW EDISON



IN SINGLE MOUNTINGS, obrounds also hug the pole, cutting bending moment and providing a very neat-looking installation, as shown in this photo of an L-M Round-Wound transformer on the lines of Public Service Company of Indiana, Inc., in a new subdivision north of Plainfield.

ANOTHER VIEW of the obround cluster-mounting, showing the accessibility of bushings and convenient arrangement for the linemen. These obround transformers may be hung on any standard cluster-mounting bracket, and spacing may be adjusted as desired.

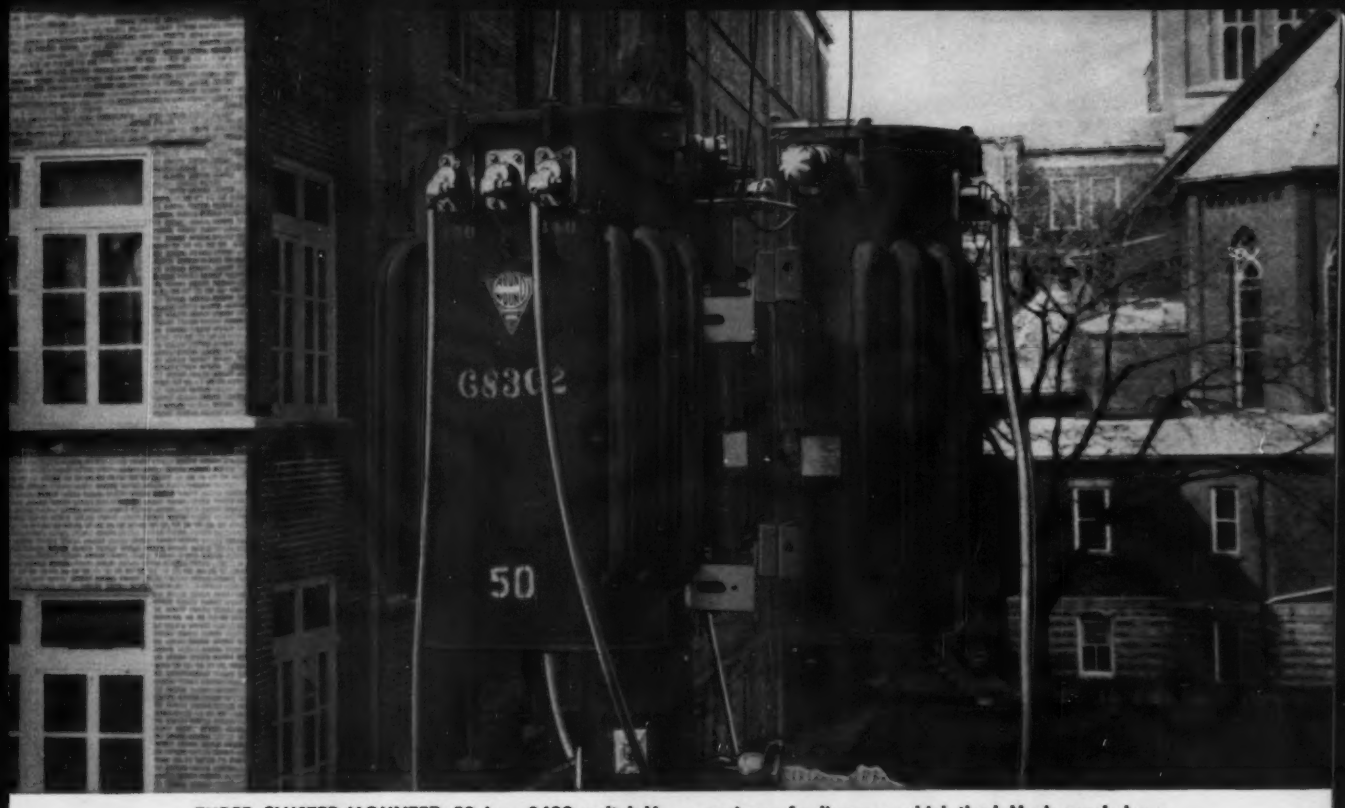


DRAWING shows the difference in size and shape between a standard round tank and the L-M obround transformer. The obround has less oil, and tubes provide ample cooling. The lighter, more compact obround hugs the pole, reducing bending moment on the pole.

PHOTOS BY
A. T. BELLER

LINE MATERIAL Industries

McGRAW-EDISON COMPANY



THREE CLUSTER-MOUNTED 50 kva 2400 volt L-M obround transformers serving a large hospital at Lafayette, on the Public Service Company of Indiana, Inc., system. The neat appearance and the convenience for linemen which the L-M obround shape offers, and the economy, performance, and long life of the L-M-exclusive Round-Wound construction are ideal for this type of installation.

Public Service Company of Indiana, Inc., Likes Neat Appearance of L-M "Obrounds"

Compactness and light weight make obround transformers easier to hang, provide more climbing space, improve pole appearance, and give highly efficient performance.

Hundreds of utility men have selected L-M obround transformers because of their compact shape, and because the performance of the L-M-exclusive Round-Wound® design is still outstanding in load capacity and economical operation.

Public Service Company of Indiana, Inc., has installed a sizable number of L-M obround transformers, in both cluster and single mountings. Among the many desirable features found in the obround design were its neat appearance, the fact that it provides ample, safe climbing space, and the good acceptance of this transformer by the linemen.

In cluster mountings, the use of the obround offers a substantial saving in material and labor over a standard two-pole platform installation. Wiring costs are substantially lower, particularly on the 167 kva units.

"In fact," one company engineer stated, "with the obround we can practically put a whole substation on one pole! This is particularly advantageous in temporary locations such as those in the Indiana Limestone quarrying areas, where stations must be moved to serve moving quarry operations."

The obround transformer goes up easily between secondary wires. In working on a single transformer or a cluster, the lineman has ample working space, and he doesn't need to extend his safety belt too far to reach the bushings. And, despite the compact shape and light weight, the obround still gives the outstanding load capacity and high efficiency for which the L-M Round-Wound core-coil construction is so well known.

Find Out About L-M Obrounds

L-M Round-Wound construction offers many advantages: high short-time overload capacity; low losses; balanced performance. The obround shape puts the frosting on the cake! Ask the L-M field engineer for facts and figures; or write for bulletins to Line Material Industries, Transformer Div., Zanesville, Ohio.

Distribution Transformers

McGRAW EDISON

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DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
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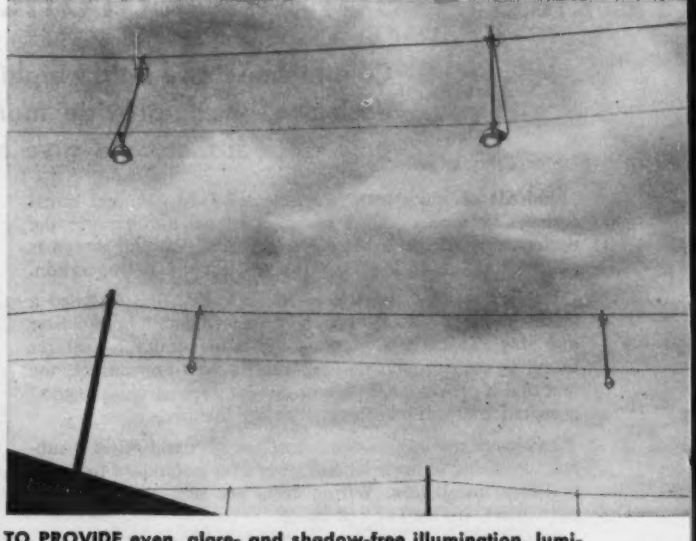
DAYTIME VIEW showing the extensive yards and coal-handling facilities the C&O recently completed near Pier 15, Newport News, Va. Here up to 2,000 tons of coal per hour can be loaded, with 24-hour operation made possible by the illumination provided by 135 Line Material high-intensity mercury vapor luminaires.

CARS APPROACHING THE COAL DUMPER. Here higher than average intensity is provided by mounting the mercury vapor lights at a 30-foot height on single or double mast arms and poles. Photoelectric controls automatically turn on the lights whenever natural lighting drops below 1.0 footcandle.



TO PROVIDE even, glare- and shadow-free illumination, luminaires are hung on this catenary system. Cables up to 300 feet long support from two to five luminaires, are spaced at 100 to 200-foot intervals. Power is supplied by an L-M Uni-Ballast constant-current series system operating at 100% power factor.

LINE MATERIAL Industries
McGRAW-EDISON COMPANY

NIGHT VIEW of the C&O Newport News yards, showing L-M high-intensity mercury vapor lights mounted on poles and supports for top illumination near the coal dumper. Lights in the background are mounted on the unusual catenary system devised by L-M engineers in cooperation with C&O engineers.

L-M Lights Turn Night Into Day At C & O Newport News Coal Yards

The new multi-million-dollar coal-handling facilities of the Chesapeake & Ohio Railway at Newport News, Va., can transfer coal into ships at 2,000 tons per hour, 24 hours per day. The new coal-handling installation has many unique and outstanding features, including excellent mercury vapor lighting.

Good visibility is essential in the operation. Light from ½ to 1½ footcandles is provided by 135 L-M high-intensity mercury vapor luminaires. Of these, 42 are on conventional supports and poles at a 30-foot mounting height, to provide high-level lighting around barney pit, coal dumper, and the coal pier. The other 93 are mounted at 40-foot height on an unusual catenary suspension system.

This system provides controlled distribution of light, minimum glare, elimination of sharp shadows, and excellent visibility for tower operators. The L-M units use a 7,000-hour lamp with a light output of 21,000 lumens. Refracting glassware provides even light distribution from the 40-foot mounting height used above the railroad yards.

Power is provided through an L-M exclusive Uni-Ballast system, a constant-current series circuit that cuts costs because it operates at high efficiency and 100% power factor. Control is by photoelectric cells which automatically turn on all lights whenever the natural light level falls below 1.0 footcandle. Thus heavy clouds or nightfall do not even momentarily hinder the continuous operation of the extensive car- and coal-handling facilities.

Ask About L-M Lighting Application Engineering

Railway yard lighting is unusual. Each job must be individually engineered. As a leader in yard lighting, Line Material has the experience, the engineering ability, and the manpower to do outstanding work in railway yard lighting.

L-M provides a complete line of outdoor lighting equipment —incandescent, mercury vapor, and fluorescent—and outstanding lighting engineering service. For complete information ask the L-M man; call the nearest L-M office; or phone or write Lighting Division, Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

Outdoor Lighting McGRAW EDISON

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Naugatuck PARACRIL OZO

The oil-resistant, ozone-resistant nitrile rubber

Now! lasting **COLORS** in rubber wire jackets

A development of Naugatuck research makes it possible to combine in a vulcanized rubber wire jacket all these properties:

- Excellent resistance to ozone and outdoor "weathering"
- Outstanding heat resistance
- High abrasion resistance
- Excellent oil, grease and chemical resistance
- Fast CV extrusion

...PLUS PERMANENT BRIGHT COLORS

In addition to the suggested uses, you will think of dozens of other applications where wire jacketing with all these properties can serve either an aesthetic or utilitarian purpose.

One of Naugatuck's technical representatives will be happy to discuss with any prospective user the formulation of the Paracril® Ozo compound which makes possible this combination of properties... not only in wire jacketing, but also in shoe soles, hose jackets, weather stripping and other vulcanized rubber products.

Naugatuck Chemical

Division of United States Rubber Company

825P Elm Street
Naugatuck, Connecticut

US RUBBER

Rubber Chemicals · Synthetic Rubber · Plastics · Agricultural Chemicals · Reclaimed Rubber · Latices · CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Ltd., Elmira, Ontario · CABLE: Rubexport, N.Y.

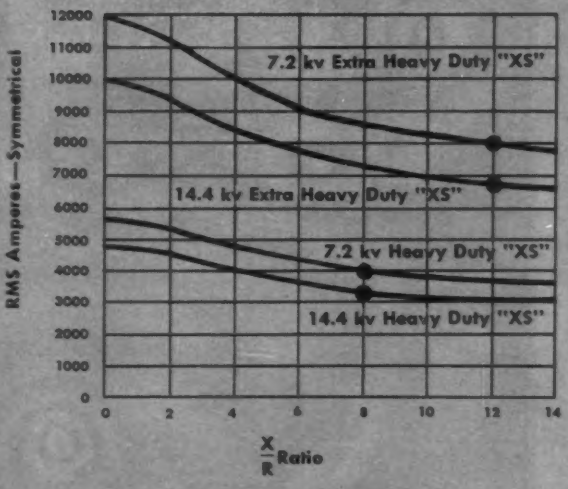
new symmetrical interrupting ratings for XS Cutouts adjust lab results to field conditions

S&C matches actual ratings to system short-circuit calculations—

50/60 Cycle Short-Circuit "Nominal" Interrupting Ratings

Nominal Ratings kv	Amperes, RMS			
	Heavy Duty "XS"		Extra Heavy Duty "XS"	
	Asymmetrical	Symmetrical	Asymmetrical	Symmetrical
7.2	5000	4000	12000	8000
14.4	4000	3300	10000	6700

Adjustment Curves for Symmetrical Interrupting Ratings of XS Cutouts at various X/R Ratios.



To simplify application, S&C has now provided symmetrical ratings for its distribution cutouts.

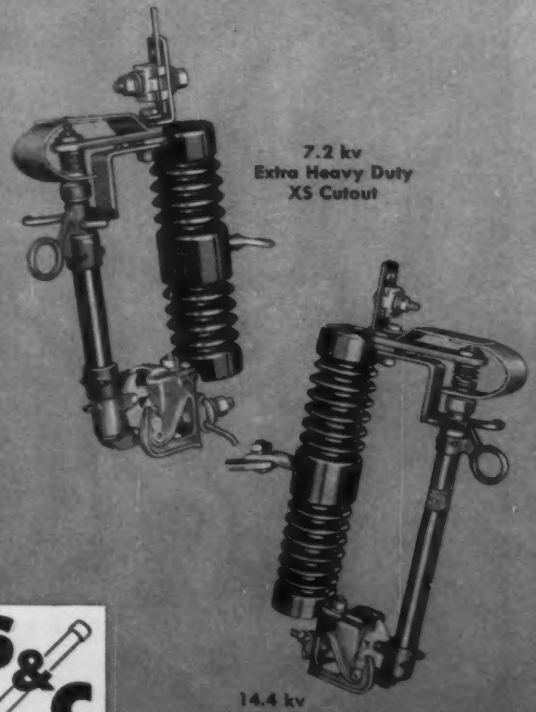
These new symmetrical ratings are provided because asymmetrical ratings are based on total available short-circuit current of the circuit, including the DC component. The asymmetrical ratings furnish a uniform, standardized measure of cutout performance, but they cannot, of course, be used directly in matching cutouts to system short-circuit calculations which yield *symmetrical* values.

The new symmetrical ratings bridge the gap and eliminate the possibility of "underprotecting" the system with a cutout of inadequate interrupting capacity, or "overprotecting" with a cutout of unnecessarily high interrupting capacity.

To arrive at a nominal set of symmetrical ratings, specific X/R ratios are assumed for the Heavy Duty XS and the Extra Heavy Duty XS,—8 and 12 respectively—typical of the conditions at locations where each of these cutouts is applied (see table at right).

To enable the distribution engineer to take advantage of more favorable conditions—that is, where the X/R may be lower—special adjustment curves (shown to the right) are provided. These curves indicate the symmetrical interrupting ratings of the XS at other X/R ratios. (Those at 0 are the *actual* asymmetrical interrupting capacities of the XS, which may differ from the *nominal* asymmetrical ratings per NEMA standards.)

For further information, write for Descriptive Bulletin 511—providing full data on the XS Cutout—to S&C Electric Company, 4421 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario.



7.2 kv Extra Heavy Duty XS Cutout

14.4 kv Heavy Duty XS Cutout

S&C ELECTRIC COMPANY

Power fuses · Tool-Operated Disconnects · Open and Enclosed Cutouts · Load Interrupters · Metalclad Switchgear · "Loadbuster"

S&C

VAPOR-COOLED AND VAPOR/GAS-INSULATED . . .

Westinghouse V/g Transformers with Liquid-Filled Capacity

Combine Dry-Type Safety and Insulation Level

The recognized safety of sealed dry-types and the higher capacities and inherent insulation strength of liquid-filled units are now combined in Westinghouse V/g transformers. A small quantity of an inert, fireproof vaporizable liquid is used as coolant. Under normal operating conditions, the vaporized coolant performs the main insulating function. A high-dielectric strength gas supplements the vapor to *insure* a full insulation level at all times.

Utilizing this principle, Westinghouse produced the world's first vapor-cooled, vapor/gas-insulated transformer **put into commercial service** . . . in July, 1957, on the network system of the Consolidated Edison Company of New York. A second V/g transformer, rated 7500 kva, 34.5 kv, was shipped in May of this year and is **now in service** at the Baltimore Gas & Electric Company.

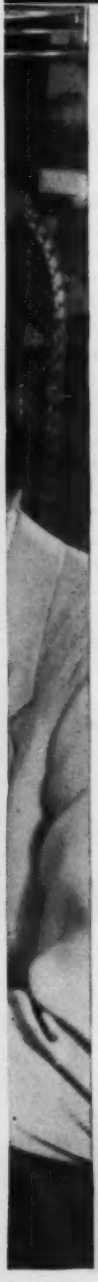
Inherent advantages of vaporization cooling let V/g transformers carry full name-plate kva *without fans* and provide exceptional overload capacity. The internal cooling is accomplished through continuously circulating the coolant liquid over the transformer windings and core. Vaporized on the core and coils, the coolant—in the form of vapors—passes into conventional coolers, condenses and returns to the transformer tank.

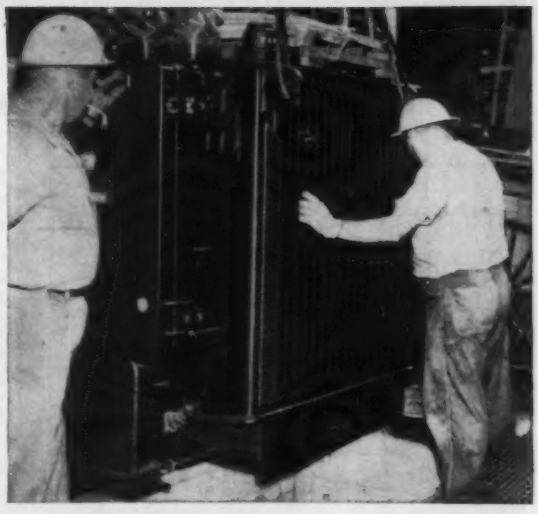
Complete safety of the V/g transformer permits installation in residential districts, crowded downtown areas, or indoors . . . with none of the usual precautions —no fire walls, no drainage pits, no sprinkler system or other fire-fighting equipment. Advanced Westinghouse insulation design provides high dielectric strength at *low gas pressures.*

Developed through Plowback of Earnings into research, the Westinghouse principle of vapor cooling—when applied to higher ratings—promises you a smaller, lighter, quieter, safer "transformer of the future." For further information on the V/g transformer, contact your Westinghouse representative . . . or write Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

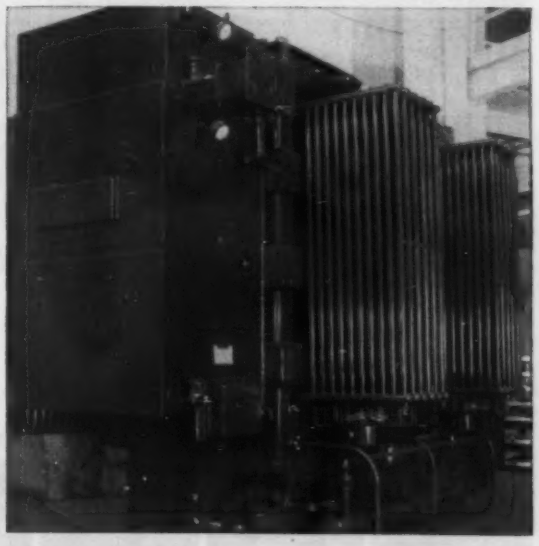
J-70887

YOU CAN BE SURE...IF IT'S **Westinghouse**

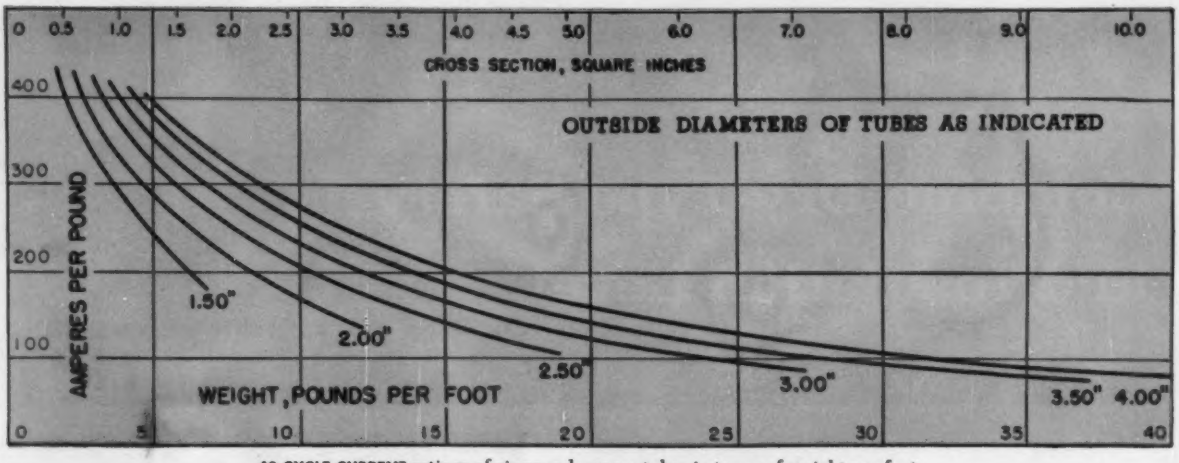




The world's first in service, this 15-kv, 500-kva Westinghouse V/g network transformer on the Consolidated Edison system completes its first year of satisfactory service.

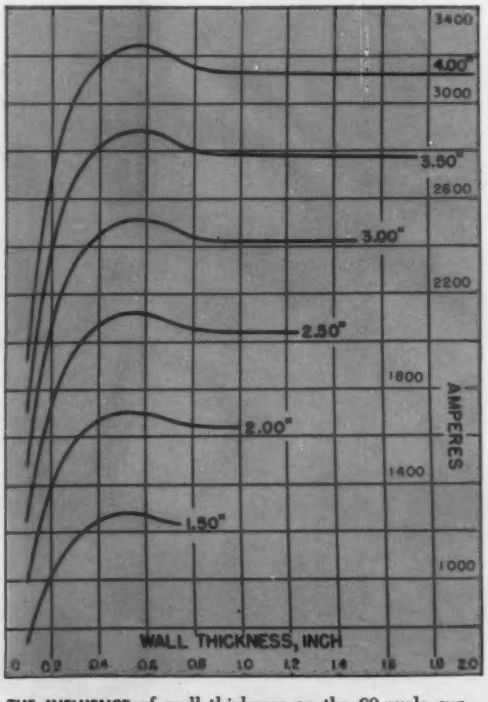


"Exceptional overload capacity!" says Dr. Paul Narbut, Westinghouse Design Engineer, right, pointing out to Dick Schmalz, Substation Transformer Sales Manager, that this 34.5-kv, 200-BIL, 7500-kva V/g transformer for Baltimore Gas and Electric Co. has a rating of 7500 kva *without fans,* and 10,000 kva maximum overload capacity with air-blast cooling. This is the second V/g transformer *in actual service.*



60-CYCLE CURRENT ratings of six round copper tubes in terms of weight per foot.

How to carry more amperes per pound of copper



THE INFLUENCE of wall thickness on the 60-cycle current rating of six round copper tubes.

THIN-WALL TUBES with low wall-thickness-to-diameter ratio offer decided electrical advantages—and opportunities for cutting bus costs—wherever mechanical requirements permit. The charts above and at the left show the 60-cycle skin-effect phenomenon characteristic of six representative sizes of round copper tube, 1.5" to 4.0" O.D. The curves cover the entire range of wall thickness from solid round rods, at the right, to the thin-walled tubes in common use at the left. What is true of round tubes is also true of other tubular bus shapes.

INSTALLATION ECONOMIES. When round tubular bus conductors can be selected in thin-wall sizes from the standard pipe dimension schedules, it is possible to effect further economies by the use of stock sizes of supports, connectors, tap clamps, and other necessary hardware available in great variety in dealers' stocks.

More complete information on tubular conductors is available in the Sixth Edition of The American Brass Company's Publication C-25. This 62-page booklet has a wealth of general information on the properties of copper conductors—plus convenient data for the most commonly used sizes of all types of rigid bus conductors.

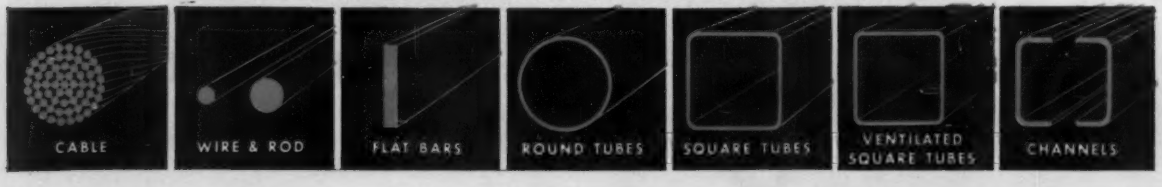
TECHNICAL SERVICES. Anaconda specialists are available to help you in the solution of technical problems involving the use of Anaconda Bus Conductors. For such service, or for a copy of Publication C-25, see your nearby Anaconda representative. Or write: The American Brass Company, Waterbury 20, Conn. 87100

ANACONDA®

COPPER CONDUCTORS

Made by The American Brass Company

THERE'S AN ANACONDA ELECTRICAL CONDUCTOR FOR EVERY NEED



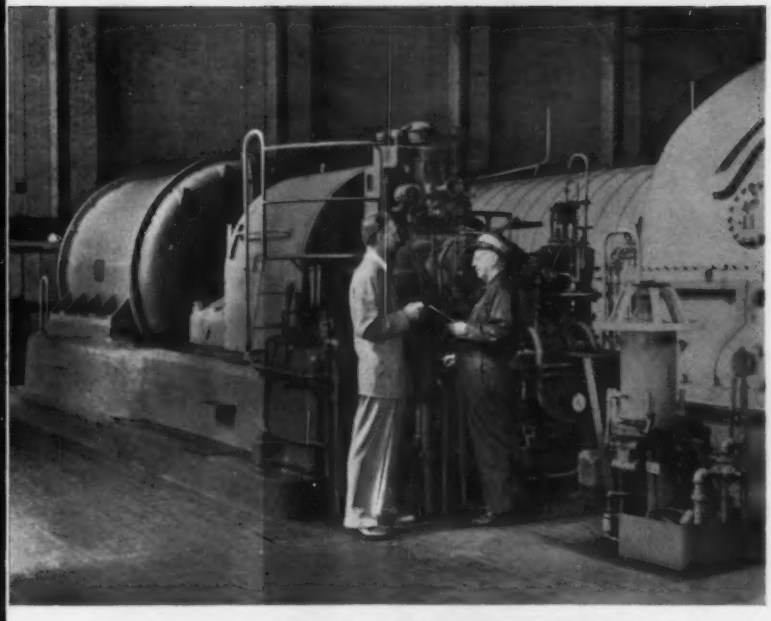
Report from Wisconsin Electric Power Company

HOW THE ONLY OIL WITH LIFE-OF-TURBINE GUARANTEE IS DOING AFTER 27 YEARS

Situation: On February 23, 1931, Wisconsin Electric Power started Turbine 12 at its Lakeside Station – a 7,700 kw. General Electric. The 550-gallon turbine oil reservoir was filled with NONPAREIL. A Standard Oil lubrication engineer was there to supervise the fill. After 30 days a framed certificate was furnished the utility. This certificate guaranteed that the NONPAREIL Turbine Oil would never exceed a level of acidity of 0.15 mg. KOH/g. for the life of the turbine.

What has happened: Analyses of oil samples have been made at regular intervals since the start-up date. The acidity level of the oil now is the same as the day it went into service –0.06 mg. of KOH per gram of oil. In the 27 years since NONPAREIL Turbine Oil was installed, Wisconsin Electric Power has added steadily to its generating capacity. NONPAREIL Turbine Oil has been installed in all turbines.

What to do: Get more information about NONPAREIL from your nearby Standard Oil industrial lubrication specialist in any of the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.**



Standard Oil's Robert A. Guis and Lakeside Station superintendent, C. E. Thielman, inspect records of Turbine 12, which has been operating with NONPAREIL Turbine Oil for 27 years. Years of experience providing technical service and an engineering degree qualify Bob Guis for work with utilities on turbine lubrication. Bob has an engineering degree from the University of Wisconsin plus 18 years of this kind of work behind him. In addition, he has completed the Standard Oil Sales Engineering School.

Quick facts about

NONPAREIL Turbine Oil

- Will not permit formation of harmful acids
- Will not permit formation of sludge or oil varnish
- Will maintain good demulsibility or water separating characteristics
- Has high resistance to foaming
- Contains adequate rust inhibitor

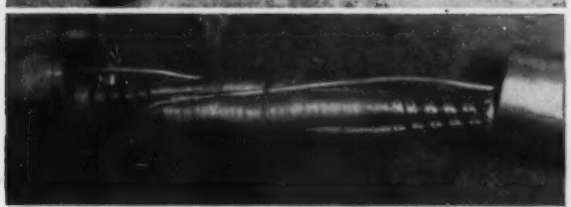
You expect more from STANDARD and get it!

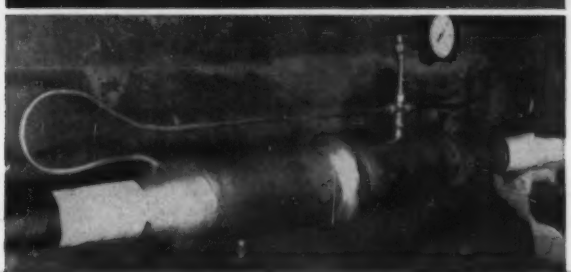
Cable shown here is 650 MCM—3/c—15 KV Paper-Insulated Gas-Filled Cable with Tellurium lead sheath and GN (glass-neoprene) jacket.

A standard cable for every special job

- Asbestos Wire and Cable
- Mold Cured Portable Cord
- Shovel & Dredge Cable
- Paper & Lead Cable
- Varnished Cambric Cable
- Interlocked Armor Cable
- Special Purpose Wire & Cable
- Aerial, Underground and Submarine Cable

USS Tiger Brand Gas-Filled Cable provides uninterrupted electrical service!





Top picture, above, Tiger Brand Paper-Insulated Gas-Filled Cable ready for splicing with GN (glass-reinforced neoprene) jacket and lead sheath removed. **Next photo** shows single-conductor splices completed with shielding and solid wall tube in place ready for sleeve. **Bottom,** completed splice ready for fireproofing. Note gas pressure test gauge in place.

TIGER BRAND GAS-FILLED CABLE provides reliable service under all operating conditions since it always operates under a positive internal gas pressure.

This cable stabilizes operating pressure at an average of approximately twelve pounds. Its uniform pressure controls sheath stresses, eliminating the major cause of failure. Tiger Brand Three-Conductor Paper-Insulated Gas-Filled Cable provides automatic sheath and dielectric supervision at all times and assures maximum current-carrying capacity. In short, it delivers top performance and saves maintenance costs.

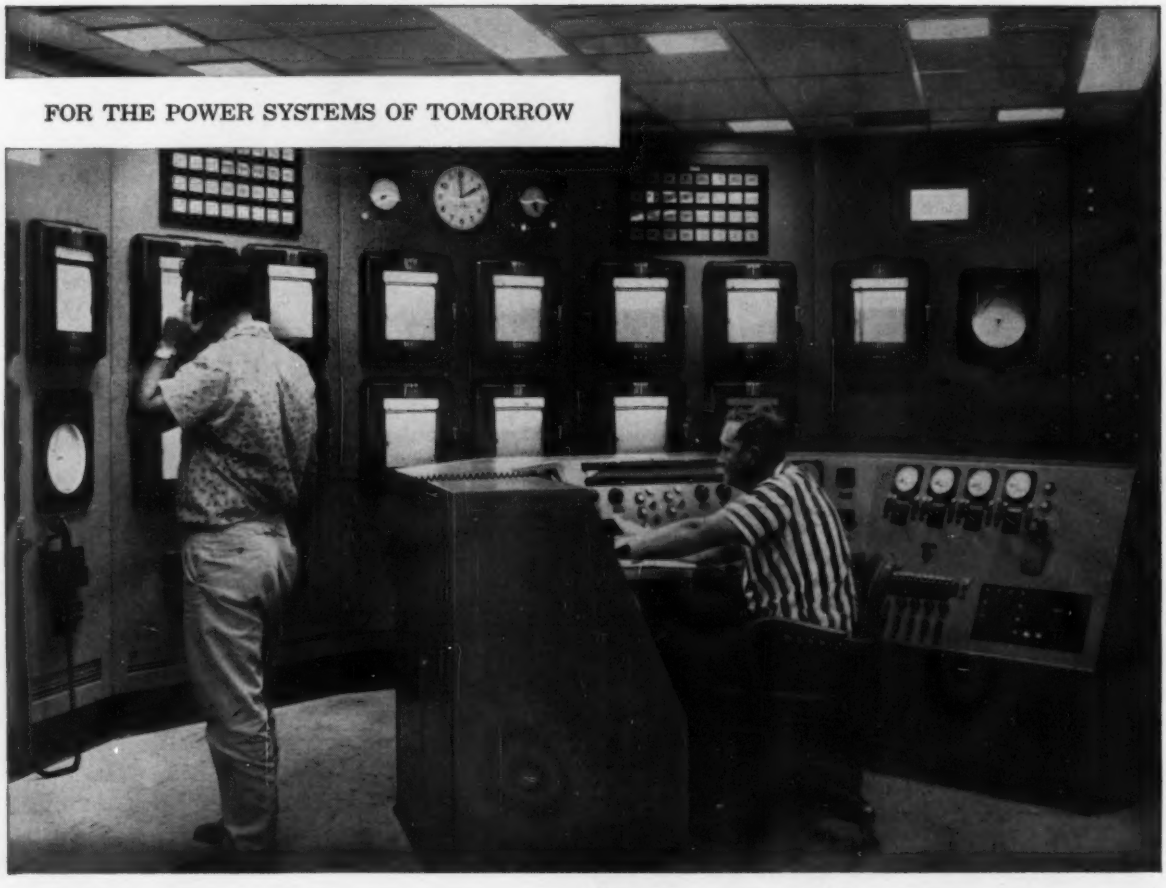
Many public utilities are using Tiger Brand Electrical Cable in their modernization and expansion programs... and Tiger Brand Gas-Filled Cable helps to insure the continuous customer service that is required. For complete engineering information, call our nearest Sales Office today.

USS and Tiger Brand are registered trademarks

American Steel & Wire
Division of USS United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors • Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, Distributors Abroad

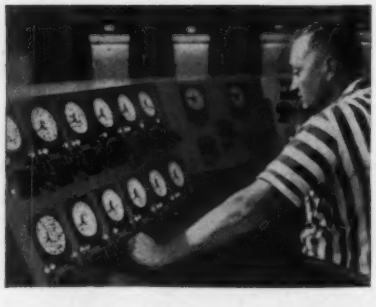
FOR THE POWER SYSTEMS OF TOMORROW



Under L&N controls, the ETR puts

Reactor Components on Trial

Written by R. N. Brey, in Charge Nuclear Systems Group, for this advertisement.



● The Engineering Test Reactor, a 175,000-kw nuclear reactor which went critical in September, is now being used for the testing of reactor components. The ETR contains the most advanced facilities yet devised for environmental studies of various fuels and other reactor materials under varying nuclear reactor pressures, temperatures, and amounts of radioactivity. Results of the tests are helping to determine the most efficient and economical reactor designs for the power systems of tomorrow.

Versatile controls required

The design of the ETR required a versatile control system that would do its job dependably under many conditions. Instruments were needed to provide information on a very large number of parameters, quickly and accurately. Controls for the ETR were planned by Leeds & Northrup as a single, coordinated system that would assure maximum precision and flexibility.

A six-channel system

The reactor is controlled through six different channels. One, a pulse-counting channel, measures and controls power rise from the low level at start-up. As the power passes to higher levels a "log N-period" channel measures the rate of rise, and a servo channel maintains the reaction at preset operational levels through a feedback loop. A process-monitor chan-

Continued on page 122

Ratings: 14.4 and 23 kv, 100 and 250 mva

with 3 tanks you're triple safe!

You get maximum protection with Allis-Chalmers outdoor distribution breakers because they have the same basic design as large breakers — 3-tank construction for complete phase isolation. This eliminates any possibility of internal phase-to-phase flashover.

In addition to 3-tank construction, you get many other benefits found in large breakers, such as two interrupting breaks per phase, self-wiping tulip and bayonet contacts, and maximum accessibility to all components.

You can learn more about these 14.4 and 23-kv units — call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS A-C ALLIS-CHALMERS

A-5624

FLEXIBILITY to

RATING: 9K V. EQUALS OR EXCEEDS ALL NEMA STANDARDS

match PERFORMANCE

in KEARNEY Type Ex Lightning Arrester

Rated *superior* in protective performance—both electrically and mechanically—Kearney Ex Expulsion Arresters now embody bracketing improvements that keep them abreast of current installation practices, add greatly to flexibility and ease of installation.

At the right are three examples of type Ex Arresters (in combination with Trip-O-Links and Type "G" Cutouts) showing the advantages of the new Kearney mounting methods..

The Kearney Type Ex Arrester, pictured in cutaway view at the left, provides effective, continuous protection at moderate cost. The Type Ex Arrester grounds out lightning surges well below basic impulse levels of protected equipment; follow current flow is limited and quickly extinguished, thus eroding very little fibre and adding to service life.

For details make a note to ask your Kearney representative.

1. **Top Electrodes** form gap to isolate arrester from line. Exposed series gap prevents contamination from forming and altering effective sparkover length.

2. **Top Cap** clamps gasket to porcelain, prevents entry of moisture. Cap suspends weight of arrester parts, distributes force over larger porcelain area to prevent high stress zones during discharge.

3. **Wet Process Porcelain Housing** protects operating elements; meets NEMA standards for wet and dry flashover.

4. **Impregnating Compound,** a high dielectric, asphalt base material, thoroughly seals arrester parts, protects against moisture and corrosion.

5. **Insulating Shield,** formed of shock-resistant paper base bakelite, prevents arc from taking alternate path through arrester.

6. **Horn Fibre Tube** extinguishes arc when power wave follows lightning crest to ground. Tube is of best electrical grade Kearnite Fibre, has high thermal withstand capacity.

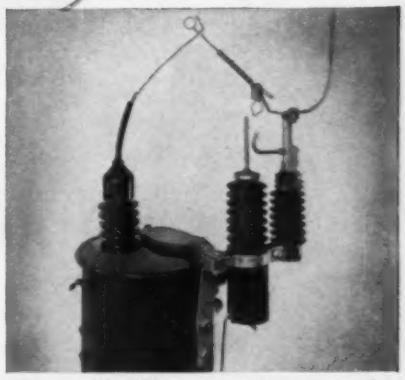
7. **Steel Shield** surrounds and supports fibre tube. Shield is at ground potential at all times, thus high field stress exists between shield and upper electrode when sparkover occurs, compressing arc streamers into spiral path quickly.

8. **Fibre Spiral** provides a sparkover path much longer than line potential can sustain, quickly extinguishes 60 cycle follow current.

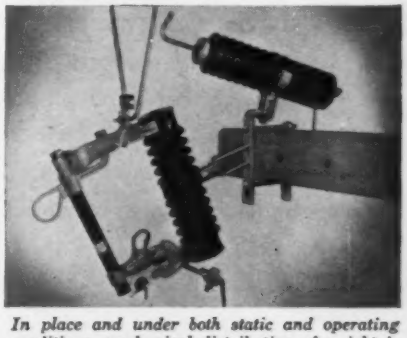
9. **Stainless Steel Vent Plate** guides discharge gases through bottom opening and into outside air. Holes permit almost unrestricted passage of high velocity steam and gas without clogging.

10. **Neoprene Washer** prevents entrance of moisture, provides resilience to absorb discharge forces.

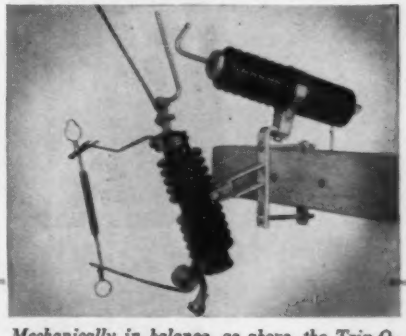
11. **Arc Chute** directs steam and gas away from live parts, prevents external flashover through vapors. It is not adversely affected by temperature or corrosive action of gases.



This simplified Kearney transformer mounting bracket permits speedy, simple and secure attachment to lightning arrester mounting pads or unused transformer bracket. Trip-O-Link fuse cutout gives positive over-current protection under all conditions.



In place and under both static and operating conditions, mechanical distribution of weight is balanced, installation is easier. In combination with the Type "G" Cutout, line fusing, transformer and capacitor protection are assured.



Mechanically in balance, as above, the Trip-O-Link provides the positive "flip-action" pioneered by Kearney.

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Balanced insulation design is the reason.

The benefits of Uptegraff's "balanced" insulation design are—a high level of transformer performance and longer service life . . . through capacity beyond its normal rating to withstand transient overvoltage conditions.

Uptegraff achieves this "balanced" insulation design by research, experimentation and testing. This means that our engineers are collecting data of various types of actual field service conditions, appraising this data relative to insulation stresses, and persistently searching and analyzing new and better insulation materials and fabrication methods.

But that's not all. Strict quality-control in the actual fabrication of coil windings and thorough testing of sub-assemblies and of the finished product are also important. The result is transformers with an extra margin of safety—making allowances for recurrent overvoltages, high temperatures, aging, conductor shape factors and other considerations.

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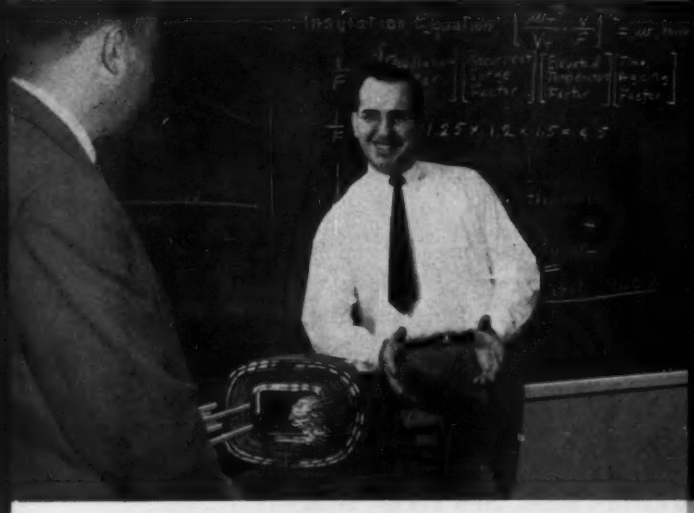
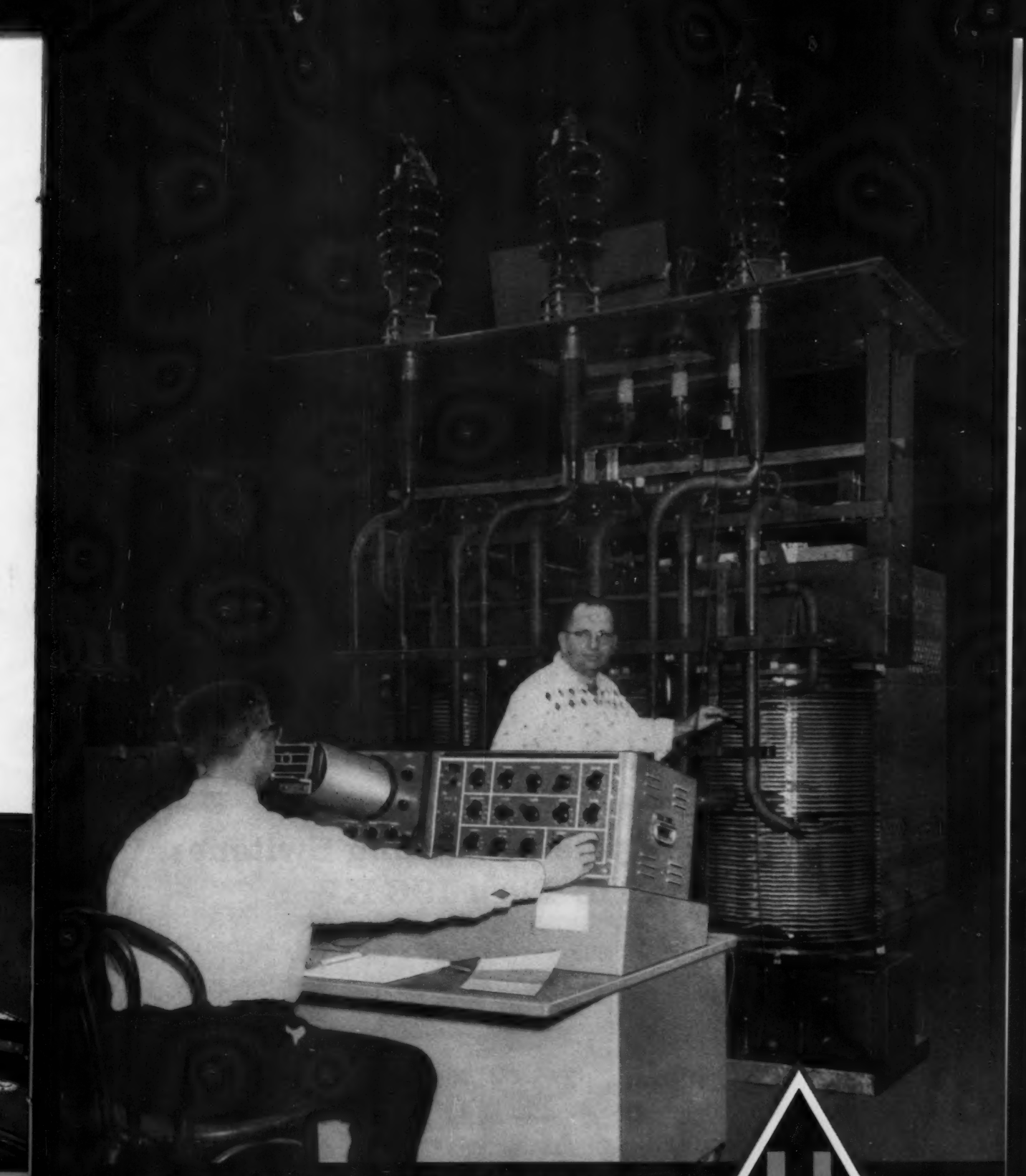
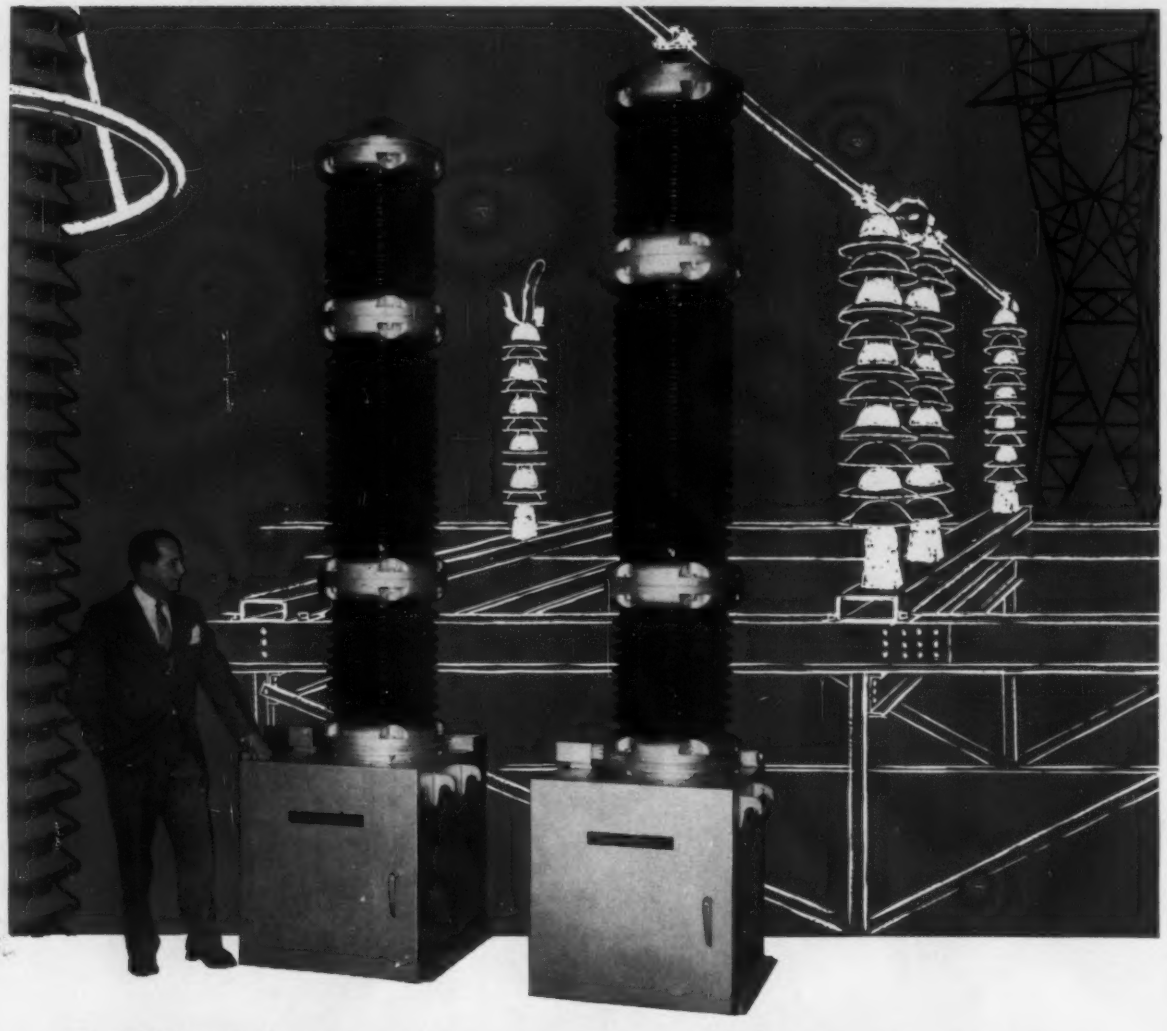


Uptegraff's unrelenting objective is to design insulation which meets specific service requirements and assures maximum insulation utilization.

Coil winding of Uptegraff transformers is carefully supervised by craftsmen who have 20, 25, and 30 years of experience in transformer building.



Uptegraff's superior transformer performance in actual field service is assured by obtaining an understanding of the voltage distribution in the windings under transient conditions. Here a transient analyzer is being used to study the transient voltages in the windings of a 3750 kva transformer.



NOW Five Cycle Grounding Switches From 115 Thru 196 KV

Another dividend of reinvestment for research at Westinghouse

The new Westinghouse 161-kv grounding switch is shown above beside the proven design of the 196-kv gas-filled switch assembly announced last year. With 20,000 ampere fault closing ability, this line of switches, now available down thru 115 kv, provides complete protection against faults in isolated step-down transformer areas. Coordination with differential relays initiates tripping of remote breakers on the high side by creating a line-to-ground fault.

Five-cycle operation provides more reliable protection than more expensive transfer tripping schemes.

Ideally suited for unmanned substations, these Westinghouse ultra-high speed grounding switches are fully enclosed and impervious to the weather. Porcelain is filled with high-dielectric sulphur hexafluoride gas to minimize contact separation—one of the important factors in obtaining five-cycle closing. Pressure switch provides complete fail-safe operation. These grounding switches are the first in a full line of ratings.

For detailed information about this economical protection for your remote transformers, call your Westinghouse sales engineer. Or write, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-60964

YOU CAN BE SURE...IF IT'S

Westinghouse

Courtesy Mount Wilson Observatory

FROM BEYOND THE SKY TO BENEATH THE SEAS

In the field of communications, two extraordinary events have occurred within a short span of time. One was the linking of Europe to America by the submarine telephone cable. The other was the sending of radio signals from U. S. satellites in outer space.

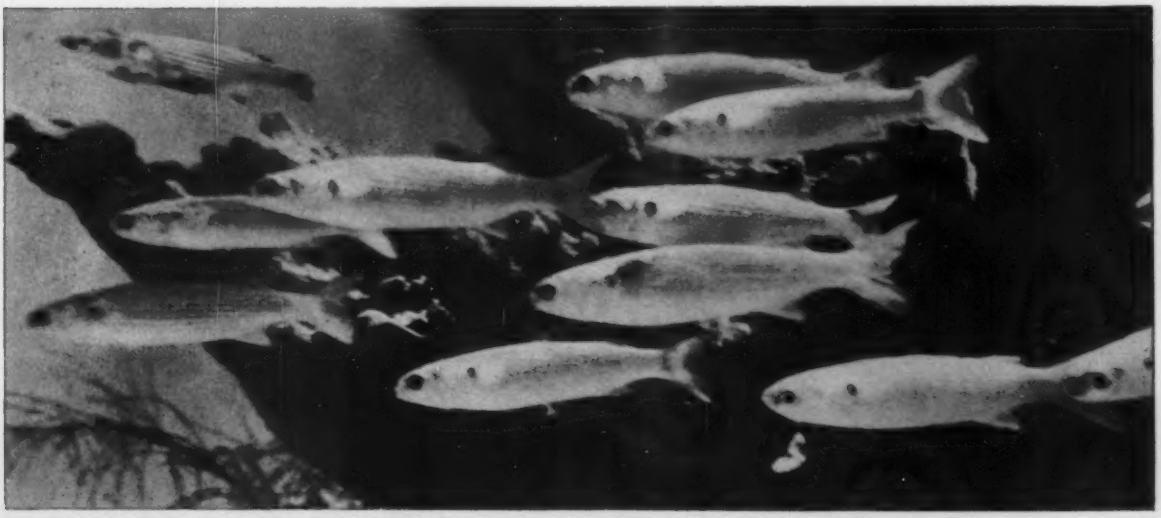
Both achievements depended on developments from Bell Telephone Laboratories. The cable was made possible by development of long-life electron tube amplifiers able to withstand crushing pressure on the ocean floor. The satellites derive their radio voices from transistors—products of basic research in semiconductor physics.

The deep sea amplifier and the transistor illustrate the wide range of work at Bell Telephone Laboratories. Here, over 3000 professional scientists and engineers explore and develop in physics, mathematics, electronics, chemistry, mechanical engineering, even biology—in every art and science which can help improve electrical communications.

Through this work, Bell Telephone Laboratories has helped make your telephone service the world's finest—and will keep it so.

BELL TELEPHONE LABORATORIES

WORLD CENTER OF COMMUNICATIONS RESEARCH AND DEVELOPMENT



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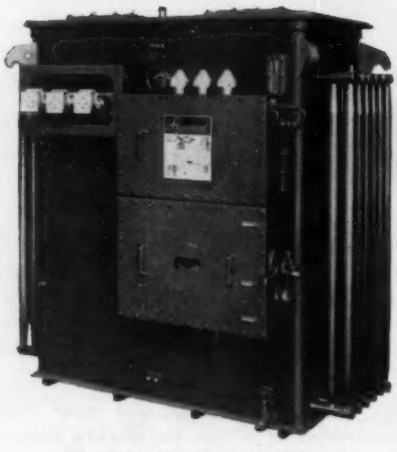
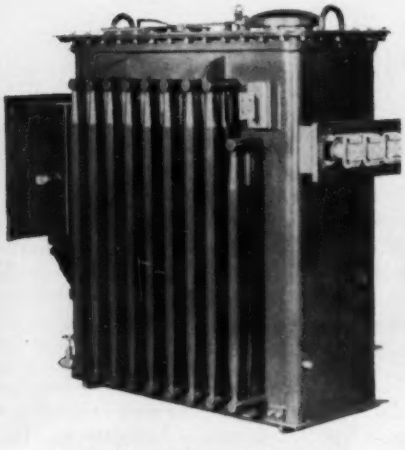


Oil filled with primary switch and protector type throat on one side instead of opposite ends to permit installation in an existing vault.



Askarel filled with usual arrangement of high and low voltage terminations for installation in a limited space.

Oil filled with primary switch and protector type throat on one side with "pancake" type radiators to permit ease of cleaning and maximum cooling.

You pay no premiums, select your own components and get your network transformers designed to your specifications in less time at Standard. The three units illustrated point up the need for transformers DESIGNED for the duty they perform. Each unit has the same basic design and performs the same basic duty in a network system . . . BUT THEY'RE ALL A BIT DIFFERENT. These variations permit these units to be used in existing locations and utilize existing circuits.

There are extra benefits in Standard's LO-TEMP units. They have ample steel and ample copper that give you extra capacity at no extra cost. Extra capacity adds up to longer life and no service interruptions. These are the considerations that mean added revenue to you.

Get the facts on Standard's LO-TEMP Network Transformers from your nearby Standard representative today. He'll show you, in dollars and cents, how you can get premium transformers at off-the-shelf prices.

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Editorial Comment

AUGUST 18, 1958

Electric Heating: Good Insulation is the Utility's Responsibility

It is being recognized by an increasing number of utilities that good thermal insulation is an absolute prerequisite for the satisfactory operation of electric heating or heat pumps. It is in the power company's best interests to see that insulation in electrically heated homes is done with proper materials, properly installed. Therefore, in some measure, it becomes the utility's responsibility to work out a solution to this problem.

One such solution might be to have the electric heating or heat pump dealer take on the insulation job and so be responsible to the customer for the entire project. Another might be to help the equipment dealer and the insulation dealer work out a cooperative, mutually-profitable arrangement, whereby they can do the job properly and be jointly responsible. Several advantages accrue to all parties under either one of these arrangements:

- The dealer(s) will be able to bid the complete job, including the insulation. This can be a big help to builders, and the customer will know exactly how much the total bill will be.
- It will establish on the customer's level a "center of responsibility" for the quality of the electric heating or heat pump job.
- It will go a long way toward insuring that operating costs will be reasonable. This is the most important point so far as the utility is concerned. For if the insulation job is a bad one and costs are out of line, electric heating will suffer a blow from which a score of subsequent good jobs will not help it recover.

The Economic Waste of Accidents

Are electric utilities, like other industries, perhaps missing a bet in their accident prevention activities? For years they, like other industries, have talked safety and accident prevention from the humanitarian viewpoint, which is a very worthy approach. The desire to have employees live full and productive lives, providing for and raising their families, cannot be praised too highly. Certainly from the viewpoint of getting results in accident prevention it is difficult to visualize an appeal that should produce better results.

However, isn't it true that it is difficult, and appears at times to be almost impossible, to get the average employee to visualize himself as the victim of an accident, until it is too late? Doesn't this really account for most of the careless practices that lead to accidents?

On the other hand, isn't the average employee better able to appreciate the economics involved in accidents today if management takes the trouble to compile them and present them effectively? In that process management itself may get a new appreciation of the costly economic facts of accidents.

If management develops the economic approach to accident prevention it will be in the best possible position to say "We just can't afford to have employees work carelessly." With the general knowledge of economics that employees have today, they will appreciate this straightforward approach and will know that when management insists upon safe work practices it has its own good solid reasons for that insistence.

The employee that has a tendency to take the attitude "it's my business if I get hurt" will not have a leg to stand on. If nothing more, such an approach would give management one more weapon in the accident prevention battle.

Campbell Reconsiders REA Ruling

Comptroller General's decision, which could limit co-op competition, is suspended for the re-evaluation period

Comptroller General Joseph Campbell, confronted with a stoutly-worded 17-page brief of dissent from the Agriculture Dept, this week began reconsidering his ruling that would deprive rural electric cooperatives of federal loan money for competing with private utilities.

While he is reconsidering, Campbell has suspended his decision. Electrical World learned last week that he wrote the Agriculture Dept to this effect. Informed sources say the move does not necessarily foreshadow any intent of Campbell to reverse himself, but it does permit the Rural Electrification Administration—for the interim of reconsideration—to exercise its loan-making powers as before. It also removes external pressures on Campbell, brought mainly by the department and the National Rural Electric Cooperative Assn, for a hasty decision.

The Agriculture brief, submitted in behalf of both the department and the REA, takes exception to every major premise upon which Campbell based his original decision (EW, Aug. 11, p 35).

Decision May Be Flouted

Moreover, its tenor convinced many Washington observers that Agriculture Secretary Ezra T. Benson and his aides have decided—in the event Campbell will not reverse himself—to flout the decision and keep on operating REA as is. Bearing the signature of True D. Morse, acting Agriculture Secretary in Benson's temporary absence, the brief says among other things that:

1. Campbell's decision is "patently inconsistent with clearly demonstrated congressional intent in enactment of the Rural Electrification Act" and it quoted out of context and distorted a recital of 1935 legislative debate on the issue.

That issue is whether Congress intended to prohibit co-op loans in "areas" where private utilities are willing to provide adequate central-station service to new customers. Campbell says yes: the Agriculture Dept and co-op spokesmen say the only limitation, either specified in the act or implied in the debate, was to prevent co-ops from serving "persons" already receiving central-station service.

2. The decision turns around "uniform administrative practices" of REA since its inception, and is in "direct conflict with legal interpretations" of the act made by past and present officials of the Agriculture Dept, the current Justice Dept, and by Lindsay Warren, Campbell's immediate predecessor as Comptroller General.

3. "Chaotic and drastically prejudicial effects on the rural electrification program as a whole, on the currently presumed financial soundness of hundreds of REA borrowers, and on the stability of rate structures affecting hundreds of thousands of farm consumers" will follow if the decision is to stand.

Millions at Stake

On this last point, the Agriculture brief says, "Since the inception of the electric program under the act, hundreds of REA loans involving many millions of dollars have been made to finance service to persons in rural areas who were actually without central-station service but who were in service areas of other suppliers and could be served by them at their proposed terms and conditions.

"If the decision is to remain in effect, responsible administration would require a survey and determination of those cases and initiation of steps to collect from borrowers millions of dollars which, under the terms of contracts entered into in good faith, are not yet due."

As to legislative history of the act, the Agriculture brief cites both House and Senate colloquies on the very question now at issue. The current speaker of the House, Sam Rayburn, (D-Tex.), is quoted back to 1935 on the aim of the REA Act: "To bring electrificataion to people who do not now have it." In the Senate, the late George Norris—foremost private power critic of his day—engineered similar language.

Service to 'Persons' Was Intent

The brief says: "It is . . . the paramount fact that at the time . . . there were two alternatives before the Senate: that embodied in the original bill, authorizing loans for the benefit of 'rural areas not receiving central-station service' and the other embodied in Sen. Norris' committee's report authorizing loans to 'persons in rural areas who are not receiving central-station service.' The latter alternative was adopted by Congress; the former was not."

On this basis, the Agriculture brief concludes that Campbell apparently failed to realize that the "change reflected a vital difference between making unserved rural areas and, as finally enacted, making unserved persons in rural areas the test of REA's lending authority."

As of last Wednesday there was no response from Campbell or the Government Accounting Office, which he heads.

Campbell's decision involved a $120,000 loan for generation and transmission facilities with which the Greene County (Iowa) Rural Electric Cooperative is serving a new plant of the Lehigh (Iowa) Sewer Pipe & Tile Co. He told the Agriculture Dept to take steps to recover the $120,000. He cited existence in the same area of facili-

CAMPBELL: 'It doesn't happen often'

ties owned by Iowa-Illinois Gas & Electric Co, which sought to serve the pipe plant and was turned down.

The Agriculture Dept is reluctant to undertake any such recovery. Its brief sets down legal grounds that, most observers believe, can be used to support its position if it defies Campbell.

For one thing, the brief discloses that Iowa-Illinois sought permission to file a suit in federal district court attacking the legality of the loan. The Justice Dept refused to grant permission for the suit (which would have been against the government, therefore- requiring permission) and, besides that, made a finding "that the loan was valid and authorized under the act."

For another, the brief says, Campbell's position already has been rejected by a federal court (Kansas City Power & Light Co vs McKay et al) after "a lengthy trial, exhaustive argument, and the submission of extensive briefs."

The Big Question

The big question is: Will Campbell rescind his decision? Campbell and his staff, although endowed with no judicial powers, are taking the judicial view—that they should say nothing now about the case. One source says, about the possibility of Campbell reversing himself, "It wouldn't be too unusual. It doesn't happen very often but we have changed our minds in some instances."

Campbell is in a secure position to withstand the howls of protest. His is a unique job; he owes his appointment to the President, but he is responsible to neither the Administration nor to Congress, although his function is to keep an eye on federal fiscal policies and operations and advise the House and Senate on apparent violations by bureaus or departments.

Moreover, he is firmly ensconced in his office for a 15-year term that will last until 1969. He could only be removed by a two-thirds vote of both House and Senate.

On the other hand, Campbell, who tries to keep himself out of the public eye and resists interviews, has a frustrating lack of enforcement power. His only recourse, in the event a department or agency ignores one of his decisions, is to report the matter to Congress.

The Washington Wire

- Rayburn cracks the whip on TVA bond financing bill
- International storm brews over Corps of Engineers

The on-again, off-again status of the higly controversial TVA bond-financing bill, introduced by Senator Robert S. Kerr, became a major nemesis to lobbyists and newsmen in Washington last week. As Electrical World went to press, one thing was apparent: whatever happens to the Kerr bill can be directly attributed to House Speaker Sam Rayburn, its biggest supporter.

Within one week, Rayburn gave the bill a boost in at least three instances:

1. He forced several conservative Democrats, who voted to table the bill in the House Rules Committee last week, to reconsider and vote against tabling it, thereby reversing the vote. "It was pathetic the way those men (on the Rules Committee) couldn't stand up to the speaker," one congressional source said: "They opposed the bill, but they all voted for it."

2. He got an agreement from a majority of the members of the Rules Committee to hold a hearing on the bill. (All bills going to the House floor normally must be cleared by this powerful group.)

3. He told newsmen that he might hold the House in session until he gets a vote on the bill. Congressional leaders had hoped to adjourn by August 16, and a long list of opponents have asked to speak against the bill. A controversial measure like this one may take days to clear the committee, before reaching the House floor.

The Kerr bill was reported favorably by the House Public Works Committee in late July after 30 opponents were forced to squeeze their testimony into a final, two-day hearing. Until then, the bill had lain dormant before that committee for nearly a year (The Senate approved it in 1957).

The Rules Committee's vote on August 6 to table the bill was considered its death knell, until Rayburn entered the picture. Chairman Howard Smith of the Rules Committee is opposed to the bill, and had hoped to sit on it till the session ended. However, within five days of adjournment, the Speaker has the power to call up important bills directly to the House floor, by-passing the Rules Committee.

• Inclusion, for the first time, of a controversial test-and-repair clause in an Army Engineer bid invitation for transformers last week blew up an international storm in Washington. Italy protested to the State Dept that the new stipulation —requiring a bidder to have test-and-repair facilities in the U. S. or Canada—barred an Italian manufacturer who wished to bid. Other countries were reported to be considering similar protests.

Foreign reactions and State Dept intervention quickly made the special test-and-repair requirement a matter for high policy decision. The Secretary of the Army and the Defense Dept began a hasty restudy of permission recently granted for use of the added language in bid invitations where national defense is involved.

At issue was a provision in invitations issued Aug. 1 by the Garrison District of the Corps for bids to be opened Sept. 11 on four transformers that will handle the 80,000-kw output of the second power house at Fort Peck Dam.

Sole purpose of the test-and-repair requirement, Army people point out, is to assure services in time of war or other emergency for equipment essential to national defense. Several foreign manufacturers who have previously supplied transformers to the Corps already possess facilities on this continent that meet the requirement, the Engineers say. And they believe that other foreign firms, not now equipped with North American plants of their own, could make arrangements with U. S. or Canadian manufacturers to use existing facilities for emergency repairs or servicing.

These possibilities, however, were not enough to relieve the anxiety of Administration officials concerned with foreign relations. They

regarded the appearance of the protective clause in an Army Engineer proposal at this time as a disturbing factor in a touchy world situation. With them, the argument that the special language nullifies gains made under President Eisenhower's liberalized "Buy American" policy carries much weight.

On the basis of these international implications, the Secretary of the Army last week was studying the question of withdrawing the requirement from the Fort Peck invitations and revoking the authority under which the Corps of Engineers had applied the clause. By Monday of last week, the policy problem had moved up to the realm of the Secretary of Defense. An early decision is expected.

Rates and Regulation

• Baltimore G&E reserve fund plan ruled 'premature'

Baltimore Gas & Electric Co's proposal for an "extraordinary" storm reserve fund was denied by the Maryland Public Service Commission Aug. 6. The PSC said BG&E's $2.5-million damages from a snowstorm last March should be amortized over a five-year period.

The company received approval for a $9,254,000 annual rate hike in July. The separate petition for the reserve fund would have upped rates enough to pay for the March snowstorm damage and, over a nine-year period, set up $1 million for emergencies.

An order for a reserve fund rate increase would be premature, the PSC said. "A more adequate experience should be accumulated as a basis for any future action by the commission," it added.

BRIEFS: California's attorney general's office has filed a petition with the Public Utilities Commission to compel utilities to use accelerated depreciation and pass on federal income tax savings to consumers.

Some 8,500 small industrial and commercial customers of California Oregon Power Co will get a total annual rate reduction of more than $117,000 if the PUC endorses schedules filed by the utility.

Columbus & Southern Ohio Electric Co intends to negotiate a new rate ordinance for Columbus residential and small commercial customers.

U.S. Power Picture

• Private-enterprise TVA

For more muscle in regional planning, utilities should consider a "private-enterprise TVA" approach. This is the idea advanced by Norton E. Long, Harvard University professor, in the July-August Harvard Business Review.

"Fractionated" government, haphazard development, and economic stagnation are some of the perils he cites in the struggle of metropolitan communities to achieve a sound social economic climate.

"What is needed is the metropolitan equivalent of a TVA," he suggests, to take the over-all view of regional development. The purchase by Cleveland Electric Illuminating Co of 2,000 acres of land which might have been destroyed by unplanned, unfunctional use is a case in point. On the other side of the fence, Long says, is the utility that "may resist the growth of the community as a menace to its comfortable monopoly."

Warns Long: "It may be high time we decided which of these two types of 'public utilities' we want."

CO-OPS: REA has approved a $13,971,000 loan for South Mississippi Electric Power Association to build 66 Mw in new generation.

Public Relations

• 'Grapevine' and poop sheets sharpen communications

The seed from which the grapevine grows is getting management sustenance at Atlantic City Electric Co. Employees wanting day-to-day news find it as close as their telephone.

Back in March the company plugged in a "Grapevine 277" information idea. Employees in the main office area dial the extension for flash bulletins, announcements, and news of general interest.

"The reaction has been very good," says Wilson S. Meyers, public relations director. About 96 calls come in one the average day for the one-minute recorded message. Announcements range from names of company candidates for "Miss Atlantic City" title to vice presidential changes.

Initial cost for the Grapevine 277 was $45 for two answering service machines. It costs about $39 a month to cut the records and subscribe to the answering service.

In other media, Atlantic City Electric uses two other types of information send-outs besides its monthly employee magazine. "Tailboard Topics" goes out to supervisors when important developments in employee relations, safety, and other matters require coverage.

"Flash" bulletins are also put out on a flexible deadline. On occasion these go only to division managers, supervisors, or department heads. Other times it reaches all employees, depending upon the type of information covered.

The public relations department handles both these sheets and cuts the records daily for the Grapevine.

One of the earliest utility information services was started by Cleveland Electric Illuminating Co. A daily News Summary Service was started in 1924 by Frank J. Ryan, retired assistant to Robert Lindsay, who was then president. The digest was originally for Lindsay only, but other executives also wanted to be kept informed.

Multilithed on a green sheet, the summary is usually compiled in the morning and again after lunch. It contains reports based on published news about CEI and its personnel; expansions, financing or rate changes of other utilities; federal,

(*Continued on page* 117)

On July 14, 1958, an editorial entitled "AIEE Needs a Stronger Summer Meeting" appeared in Electrical World. It opined that the session had become more a social affair than a technical forum; that administrative matters siphoned the group's leaders away from technical discussions; and that deterioration of quality in technical papers has set in. Here, L. F. Hickernell, who became AIEE president Aug. 1, presents his comments on the editorial.

AIEE Answers Meeting Criticism

There is a continuing inclination to make the Summer Meeting more a "social affair" and less a "technical forum" than the other General Meetings.

On Feb. 3, 1949, the Board of Directors adopted a resolution providing "that social features be emphasized at the Summer General Meeting and that the number of technical sessions be limited . . ." On Aug. 23, 1951, upon recommendation of the Technical Advisory Committee, the board rescinded this resolution to permit a heavier technical program. The program and attendance at the Summer Meeting vary to some extent, depending upon its location. Taking this into account, it is evident that the number of papers scheduled has increased materially:

Year	Location	Registration	No. of papers	Regis. per paper
1949	Swampscott	1,650	135	12.2
1951	Toronto	1,851	170	10.9
1953	Atlantic City	2,372	238	10.0
1955	Swampscott	2,320	186	12.5
1957	Montreal	2,350	285	8.2
1958	Buffalo	2,036	232	8.4

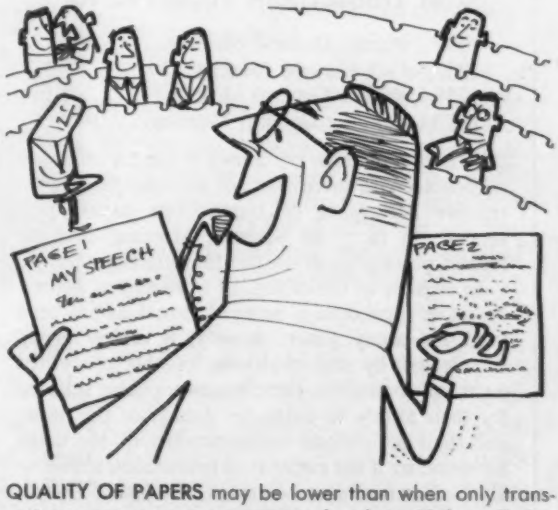
It is my personal opinion that attendance at the Summer Meeting is governed by **1.** Number of papers. **2.** Location. **3.** Conflict with other meetings.

There is a preoccupation of the industry's engineering statesmen and thought leaders with committee activities and matters of Institute administration during the Summer Meeting. Committee rooms are full but attendance at technical sessions sags; meaningful discussion dwindles.

Personnel attending committee, division, department

SOCIAL EMPHASIS at Summer Meeting was reversed, says AIEE president, by 1951 resolution. Since then, the number of papers has increased from 170 to 232 in 1958

COMMITTEE WORK at AIEE'S hot weather session is a necessity from the standpoint of time and expense, says Hickernell. It occurs at all of the group's general meetings



QUALITY OF PAPERS may be lower than when only transactions papers were programmed, admits Hickernell, but conference papers still prove helpful to some members

and board meetings at the Summer Meeting also attend them at the Fall and Winter Meetings. Accordingly, the absence of this group from technical sessions is not peculiar to the Summer Meeting. Attendance at technical sessions differs because, on an average, 10% of the membership attends the Winter Meeting compared to 5% attending the Summer Meeting.

To hold all administrative meetings separately from the General Meetings would be both time-consuming and expensive. It has been tried at times, but attendance was never as high as when held during General Meetings. It should be remembered that the Summer Meeting is the "Annual (Business) Meeting" which is attended by the 112 section delegates who are there on Institute business.

There has been a deterioration in the calibre and quality of technical papers offered for presentation at the Summer Meeting. Authors and technical committees apparently prefer to hold their most significant contributions for other general meetings where attendance is higher and the presence of specialists more apt to produce significant and thoughtful discussion.

Criticism of the quality of papers has been the most elusive of all problems I have encountered in the Institute. I wonder if we overlook the fact that since the total number of papers has increased greatly, the number of "poor" papers has increased automatically? If 10% of the 135 papers presented at the 1949 Summer Meeting were "poor", there were 14. If the same percentage applied to the 232 papers at the 1958 Summer Meeting, there were 23 "poor" papers.

I would be the first to admit that some conference papers of today do not compare in quality with the transactions papers (reviewed by technical committees and accepted for publication) of today or the old days. On the other hand, some conference papers are excellent and often are transferred to transactions status.

We have two choices. Shall we return to the days when we programmed only transactions papers, which would greatly reduce the number scheduled at each General Meeting? Or shall we continue with conference papers, which may be helpful and educational to some or our membership, even though they are not permanent additions to the art required for publication?

I have heard and participated in this "great debate" since 1947. Frankly, I do not know the preferable course; nor, it would appear, does anyone else.

It remains the task of the Institute to build up the Summer Meeting to equal professional standing and prestige with other sessions.

The 1958 Winter General Meeting required 109 technical sessions (12 or 13 in parallel) to present 449 papers in nine half-day periods. After wrestling with the problem of de-emphasizing or relieving the Winter Meeting, I have come to the conclusion that there are only two solutions: **1.** Move the meeting out of New York City. **2.** Arbitrarily allocate the number of sessions each technical committee may sponsor.

There are 50 technical committees, some more active than others. As soon as you depart from one session per committee, you are in trouble. Who is to say that Committee X may have two sessions, but Committee Y only one, or none? It must be remembered we are a voluntary, democratic organization.

For some reason I have not fathomed, authors and members prefer to attend the Winter Meeting. I do not think it is the size of the audience. At best, the session audience does not exceed 200 to 300; whereas a transactions paper reaches a potential readership of 20,000. However, the anticipated audience may have some bearing on the author's choice for presentation of a conference paper (unpublished).

Progress can best be served through a pattern of general meetings of equal technical stature uniformly spaced throughout the year.

The Institute now schedules four general meetings:

Meeting	Month	Interval (Months)
Pacific	August	2
Fall	October	3½
Winter	February	4½
Summer	June	2

Because of tradition and membership preference, it is almost impossible to change the timing of the Winter and Summer Meetings. Moving the Fall Meeting to Spring has long been, and still is, under consideration.

We do not have any pat answers but we do suggest that this problem of achieving a stronger Summer Meeting be given careful consideration.

The officers and members engaged in administrative activities in AIEE welcome constructive criticism.

As we grow older, there is a tendency to look back on the "good old days." Could it be that the papers and programs were no better 10-15-20 years ago but we saw them through the eyes of youth, or had not seen so many?

I am confident that the Technical Operations Department will solve these and other problems associated with our meetings, encouraged by the interest of those who take time and trouble to set down their reactions.

% of Transactions Papers to Total

1957	Pacific General Meeting	15%
1957	Fall General Meeting	37
1958	Winter General Meeting	36.5
1958	Summer General Meeting	48.5

I think that from the above it can be seen that percentagewise there was not any decrease in the relative percentage of transactions papers presented. In fact [the Summer Meeting] had the highest percentage of the last four meetings.

In regards to the calibre of transactions papers, the same procedure is being used now as has been used for many years; namely, a review group is selected by the chairman of the concerned technical committee, these reviewers being selected for their ability to judge the quality of the paper and their review and recommendations are taken for deciding if the paper is of transaction status.—*C. T. Hatcher, vice chairman, Technical Operations Department, AIEE.*

New Methods Speed Line Construction

CHARLES F HOCHGESANG, Western Editor

● A wide spectrum of new line construction methods may be opened by the advent of a revolutionary new tool: the cargo-crane helicopter.

Revolutions in line construction methods seldom take place. Traditionally, techniques have been subject to constant evolution, responding to a complex, steadily shifting pattern of costs, line design, available tools and required erection speeds.

But the shift of the pattern lately has been bumped by increasing awareness of right-of-way cost spirals and public relations aspects. Combination of such pressures has spurred utilities, particularly in the West, to route new lines in relatively inaccessible areas.

If this trend continues, the helicopter could well win acceptance as a new item in the construction equipment complement—if cost comparisons with alternative methods so decree.

Thus is seems prudent to help introduce the cargo-crane helicopter through three articles in the following Special Report.

Meanwhile, comparatively conventional line construction methods continue to evolve. They can't be neglected while whirling rotors soar overhead. For in their evolution lies the bulk of potential dollar-and-cents savings.

So three articles are allocated to new applications of more familiar tools. Tension-stringing, skyscraper tower erection, big- and little-hole digging and new scheduling methods come under the Report's scrutiny. And techniques for erecting EHV lines and unique tubular steel structures are analyzed.

Contents:

Helicopter Dispenses with Roads in Transmission Line Building . . . . . p 66
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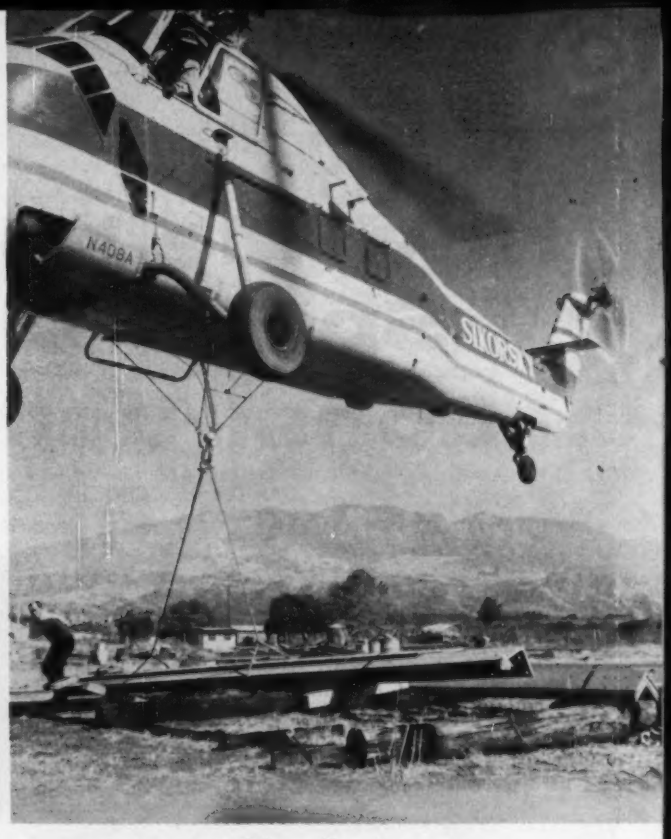
Big Augers, Cranes Speed Lines . . . . . p 73
Holds Down 230-Kv Line Costs . . . . . p 78

'Cranes' tower section into place . . .



moves steel bundles for towers . . .

Helicopter Dispenses with Roads

Southern California Edison finds aircraft procedures feasible and economical for mountainous terrain jobs

O. N. KULBERG, Chief Construction Engineer,
H. D. FISCHER, JR, Chief Transmission Engineer,
L. A. SMITH, Distribution Superintendent,
Southern California Edison Co, Los Angeles, Calif.

The cost-saving, publically acceptable "roadless" transmission line is made possible by using a helicopter for the rapid transportation of men, equipment and material, and for tension-stringing of conductor over uncleared right-of-way.

Southern California Edison Co recently used helicopters in four research and development operations exploring the new tool's capabilities and costs in transmission and distribution line construction. Results were encouraging, and Edison is now specifying helicopter use on several current line projects.

Technical difficulties were formidable, and techniques can be improved. Helicopters with greater safety, stability, and payload characteristics are forecast.

The R/W problem, common to all electric companies because of rising land cost, spurred Edison to investigate helicopter use. The company considered placing a new transmission line through mountainous terrain where it would be out of public sight. Such a line would reduce R/W cost and public displeasure, but would boost access-road and transportation costs. Minimizing dependence on access roads and on much R/W clearing thus became a prime objective.

Edison investigated the two available commercial helicopters for which payloads in the 4,000-lb range were claimed: the Sikorsky S-58 and Vertol Model 44. These machines were being sold at around $300,000, so that helicopter service, rather than the helicopter, itself, appeared to be the more economical purchase. On the West Coast, no one was offering such service.

Edison's proposed 41-mile 230-kv Saugus-Santa Clara double-circuit steel tower line seemed to be an opportunity for investigating helicopter capability and service costs. A 26-mile, 63-tower section below 1,500-ft elevation was ready for construction, the R/W having been cleared and access roads built. This section would parallel a heavily loaded, 69-kv double-circuit steel tower line, the new towers being just opposite and about 92 ft uphill. The existing line could not be de-energized.

Three transfer depots along the line section stored 593 tons of steel members, insulators, and hardware. Steel members were bundled into packs averaging 3,000 lb for bob-tailed trucking. Insulators and hardware were in 5x5-ft skip baskets around 1,000-lb gross. Each tower would take five to eight bundles of

sets fully framed wood poles . . .

dumps concrete into hopper

In Transmission Line Building

steel and one 5x5-ft skip basket.

Helicopter manufacturers were invited to fly the line route and inspect loads. Sikorsky agreed to furnish an S-58 for this job in a joint venture with Edison to "research out procedure for line construction."

Roto-Aids, Inc, Ventura, Calif., an experienced helicopter operator, contracted to fly and maintain the S-58, and provide a light Bell 47G2 helicopter for transporting personnel. Complete records of labor, fuel, lubricants, maintenance, accrued wear, depreciation, and insurance were to be accumulated.

The project was limited to transporting steel, insulators, and hardware from depots to tower sites in the made-up bundles and skip baskets. Material movement began Sept. 30, 1957.

The tightly-banded steel bundles were ideal for slinging below the helicopter, with 4x4-in. wood blocks lashed on to permit sling removal. All loads were carried horizontally on a single hook having pilot-controlled mechanical and electrical releases and an automatic under-load release.

Personnel required were a pilot, a co-pilot to watch energized 69-kv, a depot signalman, and two hook tenders, a tower site signalman, and two men to remove slings and unload skips. Tight communication between depot, tower site and craft was maintained.

Once the machine started hauling, it touched ground only about twice daily for fueling, from a portable tank at the depot. It hovered at about 6 ft while loading, and moved upward the moment the under-load release cleared the sling at the tower site.

Depot-to-site distance averaged 3.6 air-miles, ranging from 1 air-mile (3 to 5 min round trip) to eight (12 to 15 min). Average delivered load was 9.1 tons per flight-hr. The 593 tons of material were placed in 65-hr 13-min flight time, over 15 working days.

Actual cost, including helicopter 4-yr write-off (allowable tax write-off time) and insurance, was $6.80 per material ton-air-mile. This was more than comparable estimated trucking charges, but had the roads not been built and all material and equipment air-lifted, net direct savings would have been about 10%.

Edison took the Sikorsky cost data and compared them with the results of an helicopter ownership study. This comparison established a break-even rate which a commercial operator must charge to cover operating, maintenance, insurance, and fixed charges on his ship. This rate, plus a reasonable operator's profit, would allow substantial savings over conventional construction on this particular job. Meanwhile, line construction went ahead by conventional methods, using the already built roads.

Then J. F. Davenport, Edison executive vice president, called for a research and development program, for refining costs and extending the findings to other construc-

tion in prospect. Sikorsky agreed, and the ship was furnished.

Helicopter pole-setting was tried in February 1958 on a 4-mile 16-kv line extension at the 3,500-ft elevation. The extension, for a CAA installation on LeCumbre Peak, called for 43 1,200 to 1,600-lb (framed) wood poles along a mountain ridge.

Holes, predug by pneumatic hand tools and blasting, were identified by numbered 30-in. hole covers. At three framing areas, poles were preframed. Crossarms, hardware, insulators, tie-wire, armor rod, guys and anchors were attached, and the poles labled for the proper holes.

Using a 1-in. rope sling, the pilot transported and set 15 40-ft poles for a 1½-mile section in the first hour, releasing the pole electrically when it nested in the hole.

Weather for the first time affected the tests. Several clear intervals during two days were needed to complete the job in 6 hr of total flight time.

Saves 575 Man-hours

About 575 man-hr were saved from those estimated for shagging poles from the depots. The total saving was almost $2,000, about 48% of the cost by conventional setting methods.

Edison wanted data on a steel-tower job on which a helicopter moved all men, materials, and equipment. A section of the 69-kv, double-circuit San Fernando-Chatsworth-McNeil line was chosen. It was to have 15 3,800-lb towers at 2,000-ft elevation in rugged country.

Access roads had not been built. Clearing of the barren R/W was unnecessary. Construction and assembly depot base was an average 3 air-miles from the tower sites.

The helicopter airlifted to each tower site a 125-cfm, 1,800-lb air compressor, pneumatic spades, drills, explosives, and men. The crews dug 12 to 18-in. dia, 8 to 14-ft deep footing holes and used paper topping forms. The ship landed a standard 1-cu-yd 1,000-lb concrete hopper with telescoping side-hill legs and revolving chute for reaching any hole. Steel stubs and re-bar were lifted in and set.

A ⅓-cu-yd 2,400-lb bucket of concrete was suspended by air over the hopper, and the concrete was released by a ground-line. Several lifts per tower were needed for the footings.

Depot crews pre-assembled tower sections in various completion stages for helicopter handling experience. Bottom sections averaging 40 ft high and 2,000 lb were lifted to the sites and set on the stubs by helicopter.

For setting upper sections by air, specially devised guide shoes and irons were mounted, respectively, on upper and lower assemblies. The guides drifted the sections together with no one on the tower. But the guide shoes added materially to payload, and are being lightened and improved. In a special feasibility trial, one 120-ft, 3,800-lb tower was completed in only two sections.

When the conventionally erected portion of the line is complete, stringing blocks will be lifted to the test section. A Bell 47G2 helicopter will string three ½-in. manila "lead" lines in several passes, laying them between widely-spaced temporary superstructure brackets. Linemen will climb to hang blocks and thread the lead lines, which will be used to pull in ¼-in. steel airplane cable. The airplane cable will pull in ⅝-in. pulling line.

For this line, several access roads will be rough-cut to bring in Pengo rigs for conventional tension-stringing. Following sagging and clipping, the helicopter will fly out personnel and stringing blocks.

What Copter Can Deliver

Economics of the 69-kv steel tower construction showed the helicopter can deliver:

1. 5.72 cu yd per hr of concrete at $56.30 per cu yd

2. 6,300 lb per hr of pre-assembled tower sections at $.051 per lb

3. 11,200 lb per hr of pre-assembled tower panels at $.0288 per lb.

What is more important, complete handling of material, personnel and equipment was shown to be feasible where roads were few and for stringing equipment only.

The fourth research and development operation set 39 wood poles at 5,000-ft elevation for a 16-kv line extension for bringing power from Big Creek No. 8 Powerhouse to Edison's 126-Mw Mammoth Pool hydro construction site. Economics and performance here weren't as favorable. High altitude, downdrafts from steep canyon walls, and tall trees near the R/W hampered the project, as did weather also. But helicopter and line crews gained experience, and helicopter designers are developing automatic stabilizing controls for such air conditions.

The R&D phase and the Sikorsky joint venture pleased and encouraged Edison. Roto-Aids has retained the S-58, and the first Vertol 44 has been delivered to another local operator.

Recently, a Bell 47G2 transported 13 tons of floodlights and standards high on canyon bluffs, overlooking Mammoth Pool site, in 12 hr for a third of the cost of conventional methods.

Access Roads Not Needed

To eliminate access roads entirely, cable pulling and tensioning equipment and cable must be airlifted. Pengo tensioners' handling of up to 1,272 MCM is well within present helicopter capabilities, but present cable pullers are too heavy.

Edison has been assured by Petersen Engineering Co, Pengo manufacturer, that it is prepared to redesign the pullers to permit easy breakdown into two or three sections for helicopter transportation and quick reassembly at the pulling site.

But standard reel lengths of popular large sizes of ACSR, ranging from 2,800 to 4,200 ft, weigh about 5,500 lb with reel, too much for the aircraft. Shorter lengths, meaning more splices, are needed.

Pulls now are made up to 3 miles. When pulls 2 to 3 times this length are to be made, the redesigned Pengo pullers could be airlifted and long-length cable reels and the biggest tensioners transported on roads which surely exist in any imaginable location within 15 to 20 miles spacing. The pullers would work in each direction successively. No new roads would be needed, and the biggest cable sizes could be pulled by conventional equipment.

Tower weights have continued to decrease over the years, while the weight of individual tower mem-

(*Continued on page* 123)

Copter Speeds Distribution Lines

Fully framed poles are set and pulling-in cable is laid in mountainous country

M. A. KIRSCH, Superintendent of Line Construction, Pacific Gas & Electric Co, San Francisco, Calif.,
E. C. HERSAM, Division Electrical Superintendent,
D. R. HANAN, Superintendent of Distribution, Coast Valleys Div, PG&E, Salinas, Calif.

Helicopters recently used on two successful distribution line construction jobs in rugged mountainous country saved time and cost for Pacific Gas & Electric Co. Although helicopters proved practical and economical, the company recognizes that their use now is appropriate only on special projects. On several jobs, the helicopter was rejected because conventional methods were more economical.

Distribution poles were set by helicopter during removal of a 4-mile 12-kv line from a storm-battered ridge at 4,300-ft elevation to relatively protected but virtually inaccessible canyons.

In another operation, 30,000 ft of steel pulling line was laid on crossarms of a 12-kv pole line extension, permitting conductor-stringing without clearing dense underbrush and low trees in ravines. Repeated seasonal outages caused by ice build-up by turbulent, 100-mph winds brought excessive maintenance costs and poor service on a 4-mile 12-kv line in California's Los Padres National Forest. The line was built along a rugged but accessible ridge top, starting at 700-ft elevation and rising to 4,300 ft in 3 miles. It served two peaks on which were a TV transmitter, radio repeater, and forestry stations.

A 1956 study prescribed rerouting the line into canyons, rather than reinforcing it. The new route, well below the ridges, would escape turbulent winds and ice. The canyon sides were covered with shale, rocks, and brush, and no access roads were available. Road-building would be costly and impractical. Due to the possibility of erosion on steep hill-sides, road plans would be subject to US Forestry Service veto.

Virtually all construction was planned for hand and block-and-tackle methods. In the fall of 1957, poles, crossarms, and other material were hauled to the job-site and placed at two distribution points.

A hole digger tractor started to distribute materials, dig holes and set lower-elevation poles. Unable to negotiate much of the terrain, the tractor was aided by a regular five-man crew plus temporary help. Daily travel took from 2 hours at lower elevations to 3½ at the top. Men were trucked to the mountain top from where they walked down to the line.

Near completion of hole digging, reports of a helicopter's experimental setting of one pole reached the job, and Rotor Aids, Inc, Ventura, Calif., was contacted. Helicopter and PG&E men decided 62 poles could be hauled and set by helicopter in five days at most.

The operation was planned from scratch, lacking precedent. A Bell 47G2 helicopter was provided for observation and transporting personnel to work locations. A Sikorsky S-58 set the poles which were framed with all materials at a clearing near the sight. Each pole was numbered and keyed to a map. Pole holes were correspondingly identified by 2-ft sq cardboard. An 8-ft long, 1-in. manila rope sling was attached to each pole top with spliced eye at outer end for rigging to the electrically operated sling hook suspended 4-ft below the helicopter.

Two men were assigned to material locations, wearing goggles against dust, and rubber gloves against static electricity generated by the helicopter. Four men were transported by the Bell to four separate pole holes, each to guide in a pole on its arrival and then be lifted to another location.

The fully-framed poles, weighing under 1,100 lb, were carried by the S-58. A coordinator rode the cabin floor with safety belt, and guided the pilot over throat-mike intercom by looking under the ship through the cargo hatch. He contacted ground crews by radio.

The S-58 picked up, transported, set a pole and returned for another. The 4-mile average round trip took 8½ min over a 1,500-ft elevation change.

The 62 poles were set in 8 hr 30 min flying time, in three days, a job which, it is estimated, might have taken a seven-man crew at least 60 working days. Two men straightened the set poles in the holes, using hydraulic pikes which were recently developed by PG&E linemen.

Helps Lay 30,000 Ft of Line

On the second operation, near Livermore, Calif., a helicopter laid one steel airplane cable as a pulling-in line to facilitate stringing conductor on a 12-kv, two-wire pole line extension in a mountainous location. A firm contract was awarded Stockton Helicopters, Inc, to lay 30,000 ft of line.

Six of the 9 miles of main line and taps traversed an area broken by ravines and canyons, overgrown with brush and low-growing trees. A cost study showed helicopters saved considerable time and money.

Cost of the operation was just under $100 per mile. The helicopter placed the cable on the crossarm of each pole, many at angle locations. Only 2 to 3 min were required per 6,000-ft length. The pilot flew down the line, placing the cable on centerline and resting on trees and brush. The craft's speed kept the line laid taut so that it did not foul tree limbs when conductors were pulled through.

The payout device provided by Stockton Helicopters is a 3-ft long 6-in. dia spindle enclosed in a demountable canister with a 4-in. orifice at one end. Capable of holding 6,000 to 7,000 ft of ⅛-in. flexible steel airplane cable, it is mounted beneath a Bell 47G2 helicopter. The cable pays out the open end like a fishing line from a spinning reel.

PG&E provided 18,000 ft of cable, was wound onto three spindles, and re-wound after retrieving from the conductor-pulling operation, until 30,000 ft had been laid. Actual flying time average 5 min per round trip flight from landing site for laying the 6,000 ft. The machine could fly within 15 ft of pole tops.

Commercial Copters Carry Construction

The cargo-crane helicopter bids for acceptance as a construction tool for electric utilities. Since the late 1940's helicopters have been used by utilities for transmission line patrol, snow survey, line route reconnaisance, and emergency transportation of men and light gear.

The machines usually employed have been the Bell Model 47 class, capable of lifting two passengers or equivalent weight. These craft can string hemp or light steel lead lines over tower or pole crossarms. But their approximate 500-lb payload-limit makes their use uneconomical for almost any other construction.

But the Sikorsky S-58 and the Vertol 44 helicopters, certified by the Civil Aeronautics Administration for civil use, are capable of handling loads useful for utility line construction. They were developed originally for the armed forces. Civil differ from military craft mainly in interior arrangement. Basically designed for personnel transport, each has cargo-handling facilities which reduce passenger accommodations. Accessories, such as slings and hoists, have been added.

Each has a Wright Cyclone piston engine of about 1,500-bhp take-off rating. The S-58 has a 56-ft main rotor and a small anti-torque tail rotor. The 44 has two 44-ft counter-rotating main rotors. Geared transmissions deliver power to all rotors from one engine.

Each manufacturer cites specific competitive strong points. But it is useful to draw certain generalizations for utility applications.

Both helicopters are priced in the $250,000 to $300,000 range. Both cruise at about 100 mph and have a range of about 200 miles. They can hover safely with 4,000-lb payload at about 3,500-ft altitude at 60F, when in "ground effect". Maximum payload at sea-level exceeds 5,000 lb. The load with which a machine hovers safely is a direct function of air density below the main rotor(s). Density is affected by distance above sea-level, temperature, humidity, and distance above the ground.

Within 50 to 75 ft of the ground, a machine's lifting ability is boosted by the dense air cushion built up between rotor and surface, and the machine is said to be "in ground effect". Being out of ground effect subtracts about 600 lb lifting ability.

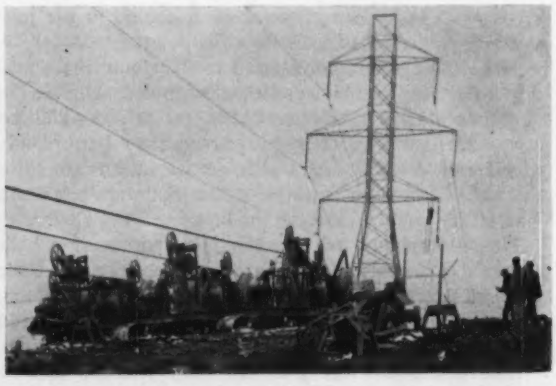
Lifting ability also varies from a 4000-lb, 3500-ft, 60-F approximate relation at the rate of 400-500 lb per 1,000-ft altitude change, and 350 to 400 lb per 10C (18F) temperature change, with capability diminished by increasing altitude or temperature. Extremely high humidity cuts lift. Summer's high temperatures reduce allowable payload.

The payload estimates assume that the plane is weighted by pilot, radio, oil, and sufficient fuel to cruise for longer than 1½ hr. Additional payload capacity can be obtained by reducing fuel reserve, at around 10 lb per min of cruising range.

The 4,000-lb rough limit permits easy handling of fully-framed poles, light steel towers, steel members,

THREE-DRUM HOIST, supplied with power by the tractor, pulls in leads during stringing of 345-kv transmission line

Transmission line construction has undergone marked changes in the postwar period primarily as a result of mechanization, special attention to corona problems, and the high 230 and 345-kv towers. The



BRAKING EQUIPMENT complements the 3-drum hoist at the other end. This brake is the key to tension-stringing

2-Ton Loads

and much equipment and material, but excludes fully-assembled H-frames or transmission towers, standard loaded cable reels, and heavy construction equipment.

The pilot's field of vision under the ship, where the cargo is slung, is restricted. And hovering stability in wind gusts needs improvement for most efficient setting of equipment.

Both manufacturers report progress toward overcoming these limitations. Both are experimenting with lightweight gas turbine engines to increase rated power per engine about a third. Both plan to equip ships with dual engines, normally coupled for maximum safety. Designers are working toward highly sensitive automatic stabilizing controls to compensate for wind gusts or air reflected off building or conyon walls by the rotors.

Consideration is given to stripping away the erstwhile passenger cabin completely, so that one dual-control pilot position will face to the rear and be equipped with full-visibility hoist controls. It would then be the first real "flying crane".

Sikorsky, referring to possible adaptation of the S-56, a proved dual-engine military helicopter having a present payload of 4 tons with piston engines, says:

"Fitted with turbines and designed specifically as a crane by eliminating its large passenger and cargo cabin, this aircraft would have a payload ranging from 6 to 8 tons. This adaptation represents the true flying crane which could most easily and most quickly be constructed. Such a crane could probably be flying within a year or so of a 'go ahead.'"

Few, if any, utilities could keep a cargo-crane helicopter busy enough to warrant purchase. They will look to service organizations who will own, operate, and maintain the craft, and bid on construction jobs.

Southern California Edison's operations indicate that the rates such operators must charge will permit savings for utilities. But the operators must seek additional workload in other industries to keep equipment load factor high and permit ample return on investment.

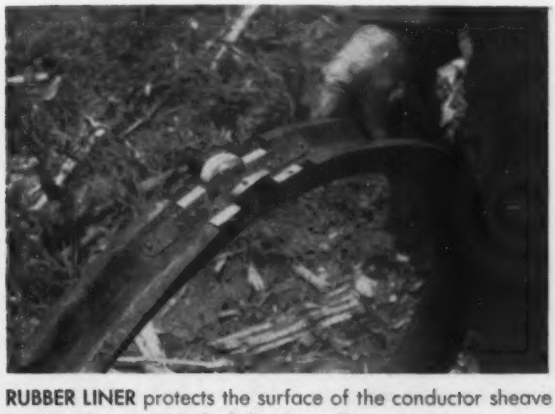
Hull and liability insurance premium rates on cargo-crane helicopters remain a difficult problem until risk experience is developed.

DUAL-ROTOR VERTOL 44 lifts Pengo skid-mounted bullwheel tensioner and can carry loads up to its 4,000-lb limit

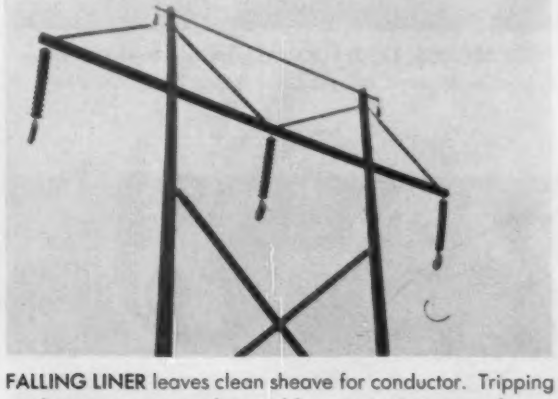
Techniques Modernized for EHV

L. E. Myers Co, Chicago line construction firm, has developed special techniques for constructing today's transmission lines. Mechanization is involved in practically every step.

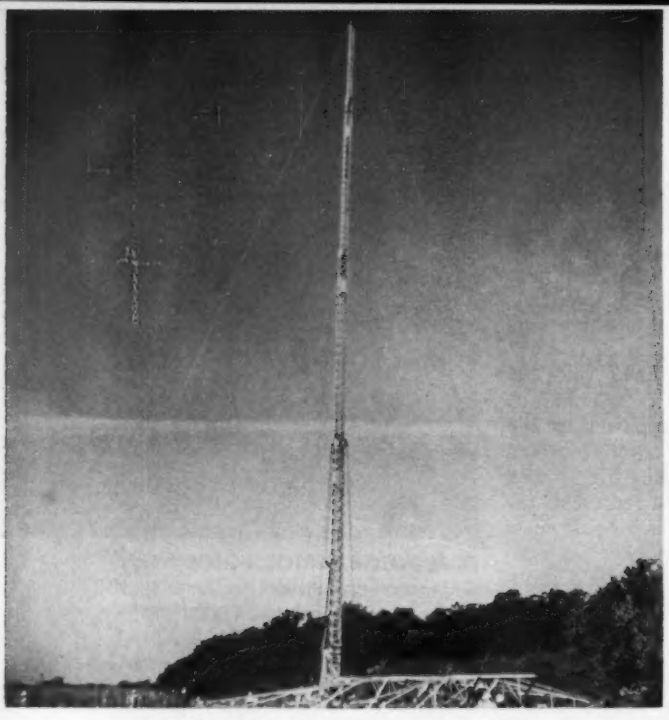
For solving corona problems Myers developed tension-stringing methods which prevent nicking and roughening of conductors during installation. Special machinery keeps conductors off the ground during



RUBBER LINER protects the surface of the conductor sheave against dirt carried along by the pulling-in cable



FALLING LINER leaves clean sheave for conductor. Tripping mechanism is actuated as cable grip passes over sheave



SECTIONAL BOOM reaches to 175 ft. Dismantling, moving to the next site and erecting the boom takes about 45 min

FOUR-SECTION 175-ft BOOM can be telescoped for traveling. It is mounted on a specially built crawler trailer

SPLICES are made with this 150-ton hydraulic sleeving machine. Attached are a die holder and frame. Guides support the conductor to insure getting a straight splice

stringing, thus avoiding any damage. Myers crews now string up to six conductors simultaneously for a double-circuit, 345-kv line.

For instance, Myers' machinery includes a three-drum hoist, supplied with power by a tractor. This hoist was used recently at the pulling end of a 345-kv installation in Ohio. As braking (tensioning) equipment is the key to tension-stringing, the firm has developed special machinery for this purpose. Although developed for 345 and 230-kv construction, tension-stringing has well recognized advantages that will probably extend its use to lower-voltage line construction.

When the first of this country's lines were operated at 345 kv, corona troubles pointed to the need for keeping conductors clean. Conductors, it was found, picked up from stringing sheaves the dirt left by the pulling cables which had been dragged along the ground. Myers developed an auxiliary-sheave device for keeping the pulling cables off the main sheave over which the conductor was to pass. Now, when the cable grip passes over the stringing block, a tripping mechanism drops the auxiliary sheaves out of the way, allowing the clean conductor to pass over the clean sheave.

When there were objections to this device, an extruded rubber liner was developed for the stringing sheaves. It also has a tripping mechanism, one operated by the cable grip. This method of preventing conductors from accumulating dirt from the sheaves has proved to be highly satisfactory.

Special Boom Builds 185-Ft Towers

The new high towers of a 345-kv line can't be constructed by raising the completely ground-assembled components or the individual pieces by means of a wooden gin pole on the tower leg. Myers uses a new 175-ft telescoping boom, mounted on a specially built trailer. The trailer has crawler treads for cross-country travel, and the boom and trailer are pulled by a tractor which is also the source of power for the winch lines that raise the tower sections. Towers up to 185 ft high can be built with the aid of the boom.

For traveling, the four sections of the boom can be telescoped, moved to the next tower site, and completely extended, all in 45 min. Its use has proved economical and has mitigated the effect of a shortage of steel tower linemen in some areas.

For splicing large transmission conductors in the field, Myers uses a 150-ton hydraulic sleeving machine. Around this machine, the firm has developed a die holder and frame. Guides support the conductor on each end, so that a straight splice is obtained.

Using a transit, Myers sets tower footings individually. The firm feels that this method is accurate and just as economical as the templet method. The transit method enables a crew to save a bad hole by speeding the digging and setting. This can be done only when the holes are prepared, one by one, in contrast to the four holes dug and set simultaneously by the templet method.

Big Augers, Cranes Speed Lines

Idaho Power's speedup program combines mammoth rigs with close scheduling

J. F. SERVIS, Construction Engineer, Idaho Power Co, Boise, Idaho

A powerful foundation digger with an 84-in. auger for grillages and a 30-in. heavy-duty auger for pole holes features mechanization made mandatory for high-speed economical construction of Idaho Power Co's extensive transmission building program.

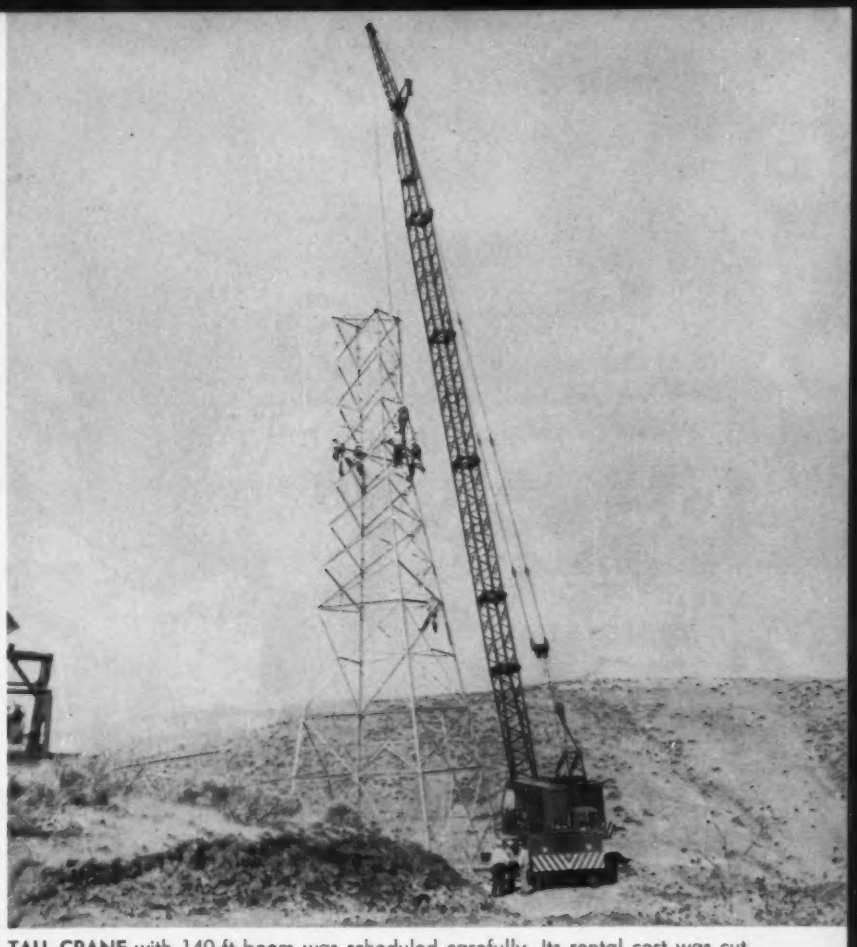
New scheduling methods, too, have cut costs by permitting reduced rental times on specific-purpose equipment, such as 140-ft boom cranes, and by concentrating specialty crews on their own skills.

Idaho Power's construction department is used to building transmission lines designated for completion "yesterday". Thus it believes that its equipment fleet has a number of probable "firsts" now widely used by other utilities and contractors.

As early as 1948, the company developed an elevating platform for cutting armor-rodding time on H-frame construction by 75%. The same year it built a hydraulic folding boom mounted on a 6x6-ft truck for cutting power erection time by about 50%. Other 6x6's mounted both compressors and wagon drill-type feed. Later, drifters were substituted for hammers on these feeds and carbide bits were used to cut drilling time by 80%.

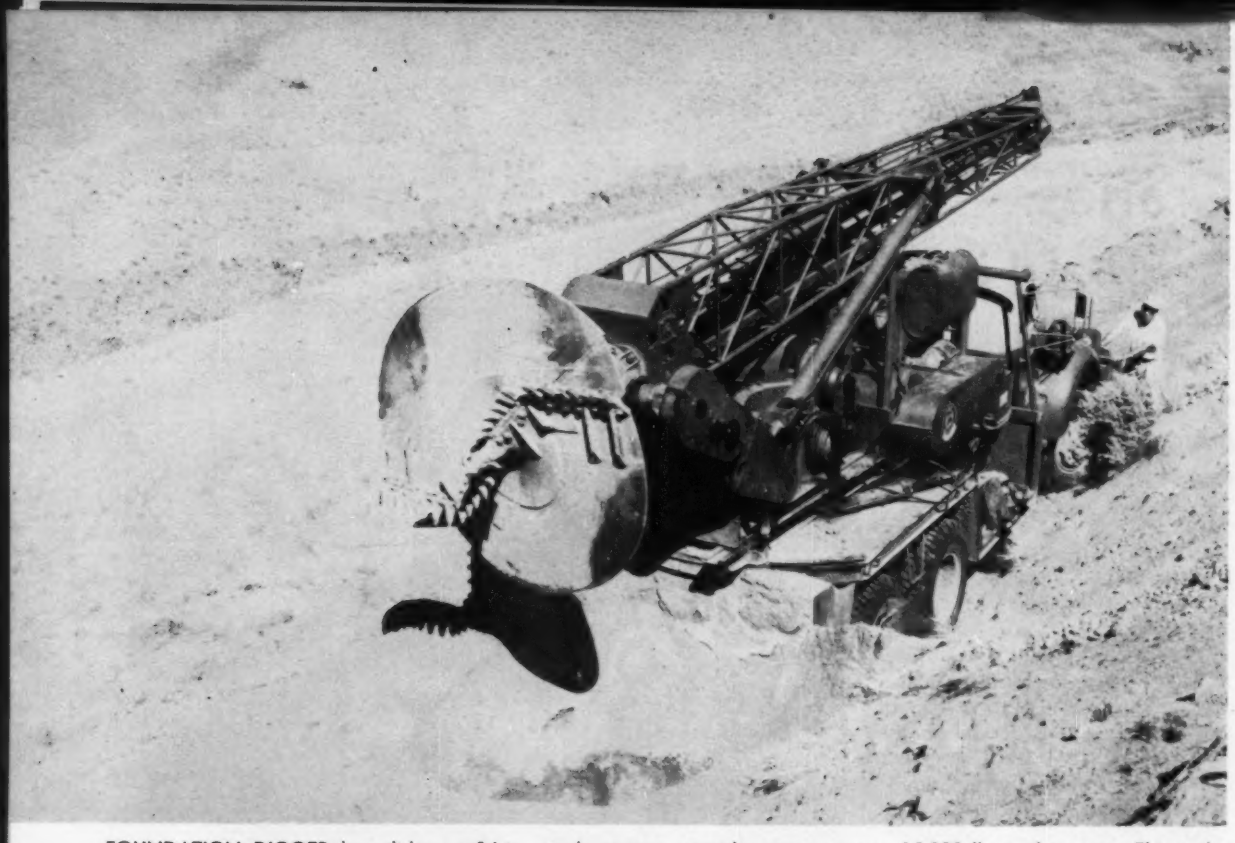
But these developments occurred while the company's major construction was wood H-frame. In the past year its steel-tower line building accelerated considerably, and this was done while operating economically.

The company's broad high-speed



TALL CRANE with 140-ft boom was scheduled carefully. Its rental cost was cut by maximum use of smaller equipment to handle lower portions of the towers

HEAVY-DUTY 30-IN. EARTH AUGER drills hole in rocky soil where blasting was necessary in the past. Hydraulic stabilizers on the truck brace digging unit



FOUNDATION DIGGER brandishes a 84-in. earth auger after completing the excavation of a grillage pit. Hydraulic crowder can put up to 15,000 lb on the auger. This is the weight exerted by the rear end of the truck on the auger

hydroelectric expansion program reaches far beyond the Hells Canyon stretch of the Snake River where it is building Brownlee (360 Mw) and Oxbow (190 Mw) as the first two of a three-dam development. Transmission was needed to move power from the remote canyon to the service area in Idaho, eastern Oregon, and northern Nevada, as well as to interconnections with the Northwest Power Pool.

Now completed are 88 miles of 230-kv wood construction from Brownlee to tie with Bonneville Power Administration at LaGrande, Ore. Between Brownlee and Boise, 101 miles of double-circuit, steel-tower, 230-kv line is close to completion. In April, the 190-mile Boise-American Falls line was cut over from 138 to 230 kv, additional insulators and shield wire having been installed last year. With the Brownlee-Boise line, Idaho Power will have a 379-mile, 230-kv system backbone. Construction of 267 miles more is planned by 1961.

The new steel towers are of the earth grillage type, requiring large footing holes. For economical digging, Idaho Power bought a highly mobile foundation digger mounted on a 45,000 lb GVW 6x6-ft truck. This equipment can handle up to a 96-in. auger and place over 15 tons of hydraulically crowded thrust (weight of the truck rear) on it. Hydraulic stabilizers at the truck rear level and steady the rig during digging. Controls are hydraulic.

Auger Digging Saves Time

An 84-in. Pengo auger was used for the Type-B, 5-deg tower foundation and a 66-in. auger for the Type-A 1-deg tower. Much digging time was saved when soil conditions permitted auger digging. Because of size of dead-end tower grillages, backhoes were used.

The foundation digger, using a heavy-duty 30-in. earth auger, digs holes for wood poles in soil and rocks where blasting had been needed. To speed steel erection at reasonable cost, the company splits erection activities into two categories, each with crews and gear.

Before erection all steel assembly that could be done on the ground was completed by crews at the tower site. These assembled body section and top section separately.

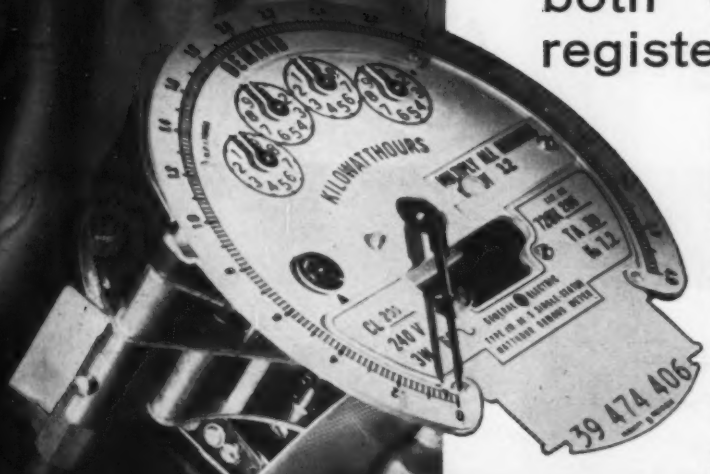
The first assembly crew, using an Oshkosh 10-ton crane with a 55-ft boom, set the base section and moved on to the next. A second crew, using a rented 30-ton crane with a 120-ft boom and 20-ft jib, was scheduled for later topping-off the tower work. On line construction to date, the company estimates that two-months rental has been saved on the 30-ton crane.

Work and crew size was prescribed so as to keep crews intact and moving from one step to another. As evidence of success, during the past two years conductor-stringing crews have done nothing but stringing. Thus Idaho Power crews have become specialized and able to complete jobs at lower cost with better standards of construction than was possible with general-purpose crews.

High speed construction makes mandatory research into every mechanized or special piece of equipment available, or that can be designed to meet the company's deadlines and keep costs in line.

±1% ACCURACY:

both G-E demand registers have it



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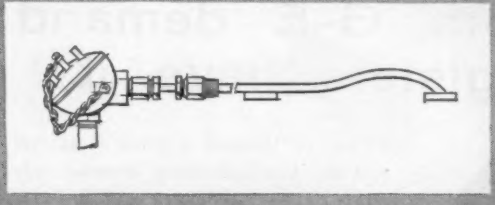
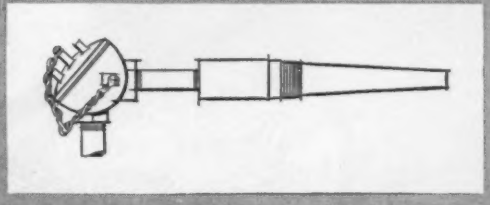


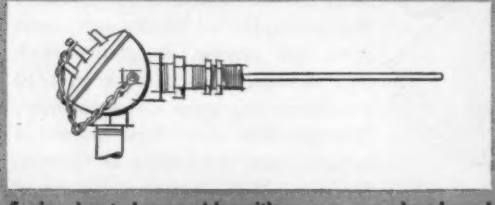
***MegopaK*® pad-type assembly**

For boiler tube, superheater outlet tube and steam drum temperatures



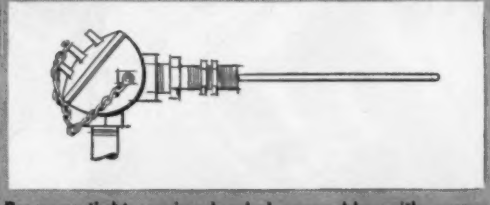
Spring-loaded, packed-type assembly with stainless steel well

For high temperature, high pressure, high velocity steam



Spring-loaded assembly with screw cover head, and mounting threads

For turbine bolt temperatures



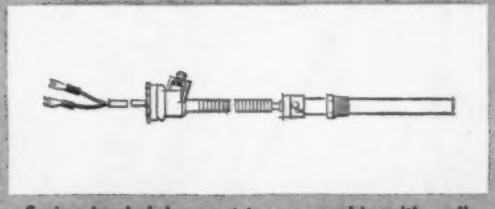
Pressure-tight, spring-loaded assembly with screw cover head, mounting threads and O-ring seal

For heavy duty bearing temperatures (under oil pressure)

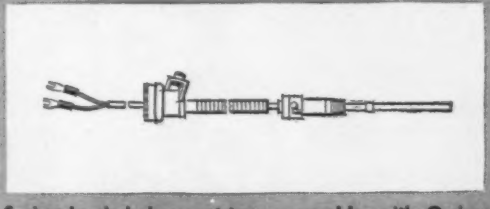
THERMOCOUPLES FOR THE POWER INDUSTRY

The specific demands of the power industry determined the design of these Honeywell thermocouple assemblies . . . and use in hundreds of installations has proved their accuracy, reproducibility, and economy. All spring-loaded units are designed for sure, positive contact, to reduce lag to a minimum. Boiler-tube thermocouples are made for durability in permanent installations. *MegopaK* small-diameter thermocouples, designed for use where space is limited, give long, dependable service. High-temperature thermocouple wire protected by asbestos and braided stainless steel, also for permanent installation, delivers excellent performance at low cost. Many other designs are available for specialized applications.

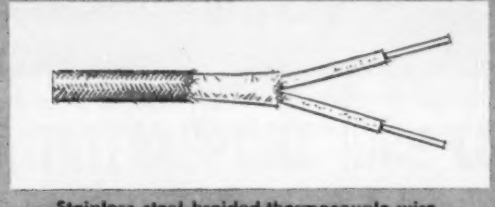
exactly to your application



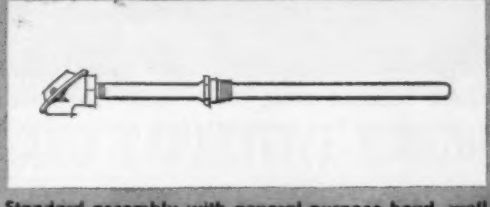
Spring-loaded, bayonet-type assembly with well
For water, hydrogen and oil temperatures



Spring-loaded, bayonet-type assembly with O-ring seal
For bearing temperatures



Stainless steel-braided thermocouple wire
For superheater outlet or steam drum temperatures



Standard assembly with general purpose head, well and welded threaded bushing
For gas and air temperatures

*Trademark, Minneapolis-Honeywell Regulator Co.

Now you can choose from a complete line of thermocouples designed and engineered expressly for the power industry, for the exact performance you require. The wide diversity of elements, heads, extension wire, protecting tubes, and accessory fittings in the large Honeywell line assures perfect matching to your application.

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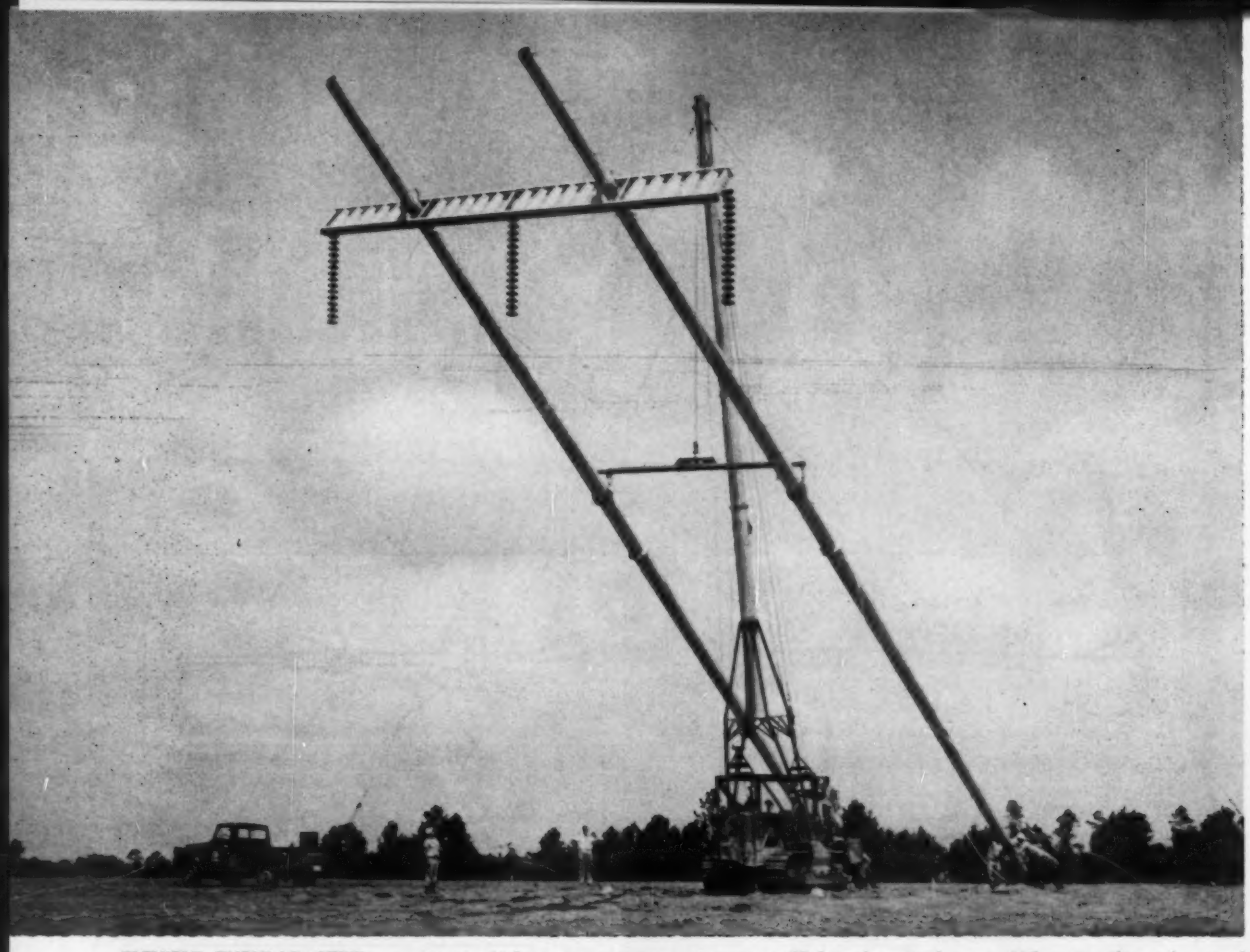


FLEXIBLE TUBULAR STEEL constitutes H-frame structures, such as is shown here being raised by tractor winch hoisting over 50-ft pole attachment. When in place the steel H-frame will be secured by eight or twelve guys

Holds Down 230-Kv Line Costs

Mechanized techniques build Georgia Power 76-mile steel H-frame line for only 12% more than cost of wood line

T. J. ALLEN, Superintendent of Transmission,
E. A. ROBERTS, Research & Development Engineer, Engineering Department, Georgia Power Co, Atlanta, Ga.

Using mechanized techniques, Georgia Power Co built a 230-kv line of flexible tubular-steel H-frame structures for about $24,300 per mile, or about 12% more than a comparable wood H-frame line. But the increased cost was more than justified by the expected reduction in wood-structure maintenance.

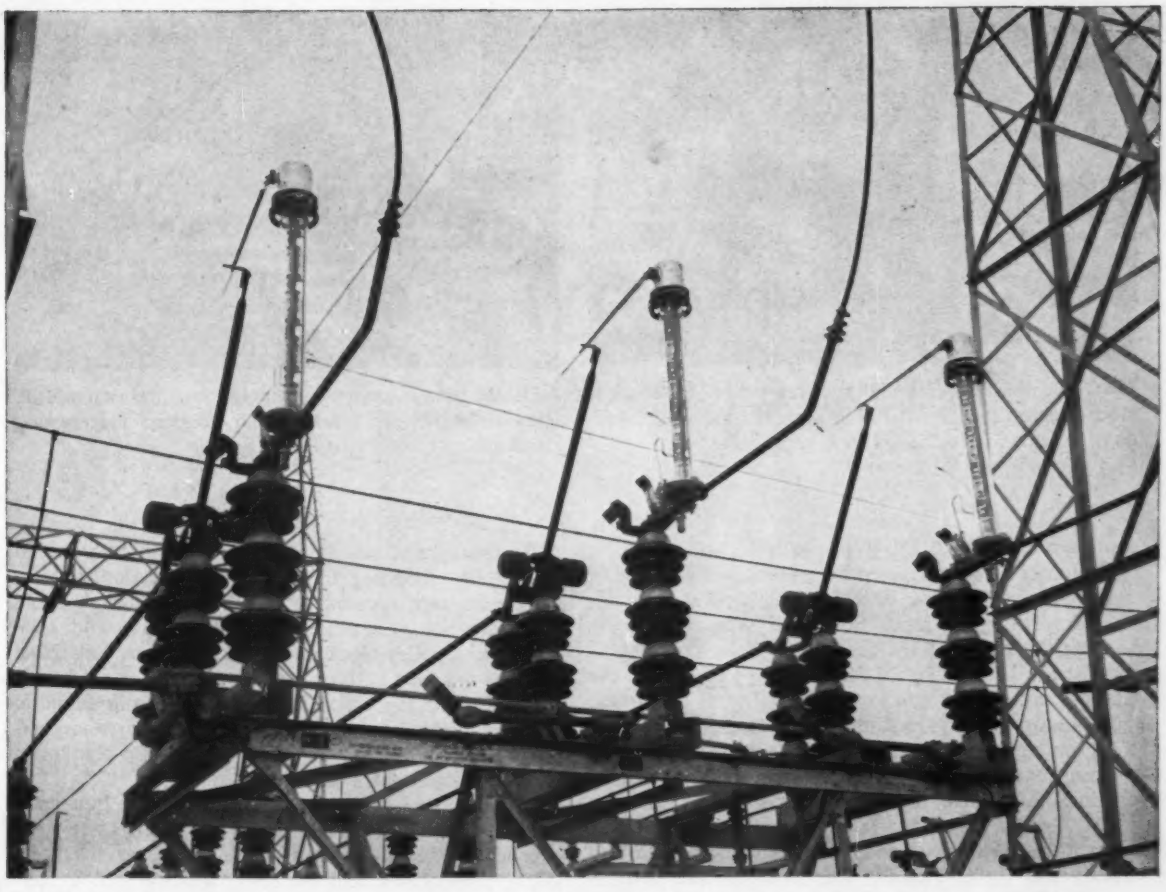
The flexible H-frame structure has two cold-rolled tapered monotube steel poles resting on precast concrete foundations. Attached to the poles with flexible shackles is a beam-type crossarm. Stability depends on guys. (For design details see EW, Jan. 14, 1957, p 56.)

Each pole has two sections bolted together at a flange in the middle. The sections measure 11.38 in. dia at the smaller end with a slope of 0.14 in. per ft to the larger diameter flanges. Four different section lengths provide structures 60 to 100-ft high, in 5-ft increments.

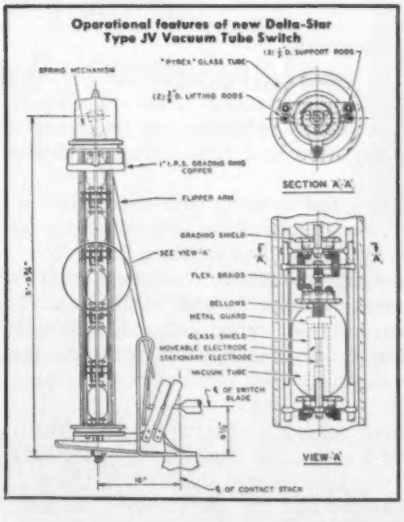
The 40-ft crossarms consist of two 9-in. x 13.4-lb channels spaced 25 in. apart with stiffener plates bent to provide torsional strength. About 10 ft from each end of the arm is an opening that passes over the pole end.

Two 230-kv lines and a double circuit 115-kv river crossing have been built of these structures. One 230-kv line extends 36 miles from the 550-Mw Yates Plant to Atlanta. The other more recent 230-kv line connects substations in Macon and Tifton 76 miles across farm lands. The same techniques were used in constructing both lines.

First holes were dug for foundations and anchors by a 42-in.-dia auger and derrick on a tractor. The derrick was then used by the eight-man crew to set the 1,100-lb precast concrete foundations which have a diameter of 3 ft at the bottom and 9 in. at the top. Cast in the top are a 1-in. bolt and a steel bearing plate to support the pole. The foundations are designed for a maximum



FOR INTERRUPTING HIGH LOAD AND CAPACITIVE CIRCUITS



—the DELTA-STAR MKV-40 Vacuum Tube Switch

RATINGS UP TO 138kv. The new Delta-Star MKV-40 Vacuum Tube Interrupter Switch answers the need for a high-voltage, high-current interrupting device of long service life at reasonable cost.

Especially well suited for switching capacitive loads, the MKV-40 operates on a thoroughly proved principle whereby the series of high-dielectric-strength Jennings vacuum tubes is in the circuit only during the interrupting cycle. Tubes are also relieved of the duty of re-making the circuit. Long, reliable service life is thereby designed into this high-current interrupter.

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For prints and technical literature, call your nearest Delta-Star representative, or write today direct to *Dept. 11C Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 Fulton Street, Chicago 12, Illinois. District offices in principal cities.*

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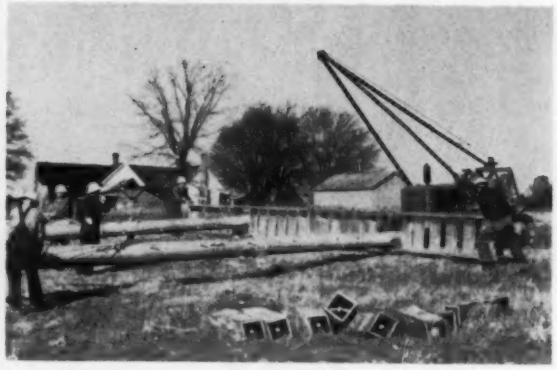
TRACTOR which dug foundation holes with 42-in. auger is used also to place the 1,100-lb precast concrete foundations, designed for 6,250 psi footing pressure



A-FRAME eases crossarm over pole tops. The arm will be attached to hangar brackets with standard shackle and clevis linkages, leaving structure flexible

footing pressure of 6,250 lb per sq ft.

Foundations were leveled by grading a maximum of 3 ft. On sharp slopes, different length poles were installed for the H-frame. Structures were leveled by varying the depth of the foundation hole, thus exposing the top 6 to 18 in. of foundation. Leveling of the bases is not critical due to the flexibility of the tower.

Eight or 12 guys stabilize each tangent structure. Four or eight in-line guys have 10-in. three-way expanding anchors, and four transverse guys have 8-in. anchors. After installing anchors and foundations, the holes were backfilled and tamped pneumatically.

As this work proceeded, a 12-man crew with two trucks and trailers hauled the structure components from the railhead to the sites for assembly. Using an A-frame on a tractor, a 10-man crew assembled the structure, bolting the flanges of two sections together to make each pole. After both poles were assembled and resting on benches near their tops, the A-frame placed the crossarm over the top of the poles. The crossarm is attached to hanger brackets with standard shackle and clevis linkage, which afforded complete flexibility.

Simultaneously, steps were threaded into the step lugs welded to the poles, and the eight or 12 guys were cut to approximate length and secured to the poles. Also attached, 20 ft apart, were the strings of 16 5¾ x 10-in., 15,000-lb insulators.

Guyed Tubular Steel Structure Costs 12% More

	Guyed Tubular Steel H-frame	X-Braced Wood H-frame
Surveys	$400	$400
Structure	10,451	6,343
Conductors	9,839	11,502
R/W Clearing	1,250	1,250
Overheads	2,344	2,100
Total	$24,284	$21,595

To erect the structure, a 14-man crew used a special setting rig consisting of a 50-ft pole section, with a sheave on top, secured to a TD-16 tractor. A cable from a winch was passed over the sheave and connected to a pulley block on the spreader bar. This 20-ft bar was attached with two wraps of chain around each pole at a step lug which kept the chain from slipping.

When picking up the structure, the boom was positioned approximately vertical. Temporary side guys gave the boom extra stability.

While raising the tower, men guided the butt ends of the poles for better control. When the upright position was reached, the butts were guided to the bolts in the foundations, and the tower was lowered so that the bolts protruded through the holes in the bearing plates secured to the butts. The bolt served as a centering pin only to keep the pole on the foundation, and no nut was used.

Poles Plumbed Separately

The eight or 12 guys were secured to their anchors before the setting rig was detached. Usually, each pole was plumbed separately by tightening one set of opposite longitudinal guys, the transverse guys, and finally other in-line guys.

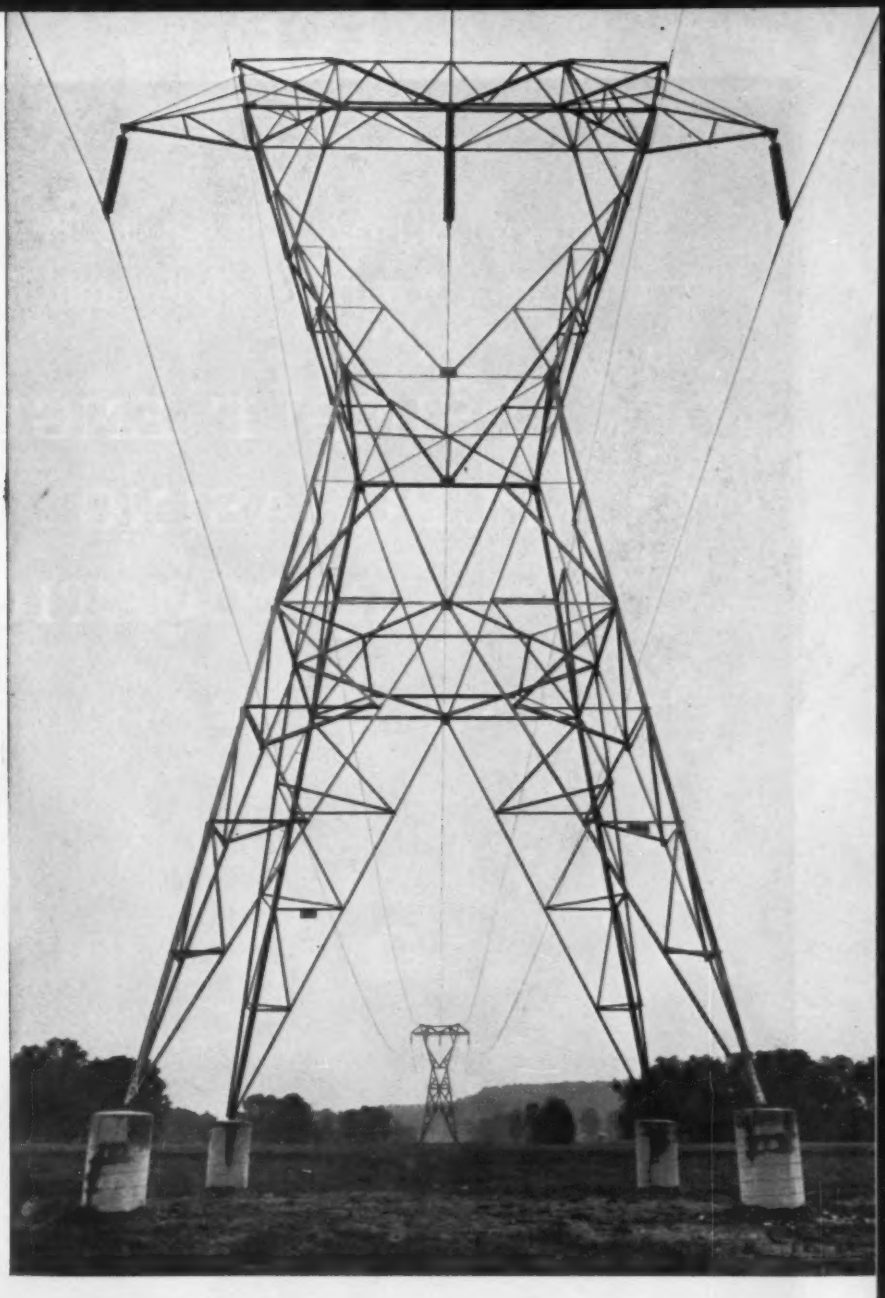
Aligning the poles and securing guys took about 30 min per structure. An average of five structures were set daily, most being 100 ft high and weighing 9,551 lb.

The wire stringing operation was done with a tractor which pulled the three 795-MCM 26/7 ACSR phase conductors and two ⅜-in. 7-strand 11,500-lb steel ground wires simultaneously from reels. As the tractor passed each structure, all conductors were placed in stringing blocks.

Conductors were sagged in 3-mile sections. Maximum tensions are 9,490 lb for conductors, under light loading, and 3,910 lb for overhead shield wires. Usually, conductors were sagged one day and clamped the next.

Before conductors were secured to insulators, 100-in. long preformed armor rods were installed on phase conductors at all tangent structures, and Stockbridge dampers at all deadends of the shield wires. Armor rods were applied by men working from ladders attached to the crossarms.

To withstand severe flooding in the Brandywine Creek area, over three miles of towers were designed with special foundations.



Philadelphia Electric uses 110 Blaw-Knox Towers to bring more power to Delaware County

From Bradford to Chichester—that's the route of Philadelphia Electric's new nineteen mile line. Carrying 220,000 volts, the new line will bring increased power to the highly industrialized lower Delaware County area.

Working as a team, Philadelphia Electric and Blaw-Knox engineers designed new light-weight towers to support three 795,000 CM ACSR conductors and two 134,600 CM ACSR groundwires.

Combining specific tower requirements with solid concepts of good tower design has been a Blaw-Knox specialty for over 40 years. Backed by this extensive experience, these skillfully engineered towers are noted for outstanding structural design, simple field erection and easy modification.

Folder 2509 details this know-how in tower engineering and fabrication. Send for your copy and tell us your needs. We'll gladly give you our recommendations and a quotation.

Transmission Towers—Steel Transmission towers, custom-built for each installation . . . multi-circuit and other special structures . . . and antenna towers, guyed and self-supporting types for AM • FM • microwave • communications • radar • parabolic antennas.

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CSP integral primary unit substations . . .
coordinated, assembled and tested by Westinghouse . . .

SINGLE ENGINEERING PURCHASING . . . SINGLE-RELOCATION WHEN

RESPONSIBILITY SIMPLIFIES
UNIT FLEXIBILITY PERMITS
LOADS SHIFT

Completely self-protecting and self-contained, the Westinghouse CSP® unit substation is ready to install. No special engineering is necessary; Westinghouse has already coordinated, assembled and tested all component parts . . . Here is a complete package that streamlines and simplifies your purchasing — with undivided responsibility for meeting your every requirement.

These units offer excellent economical advantages for loads of moderate to high load density, particularly where the load is expected to shift in the future. Installation is rapid and economical, the single unit requiring but a single pad; no interconnection and coordination of components.

Single-unit flexibility eases relocation problems, too. The complete substation can be disconnected, moved to the new site and reconnected.

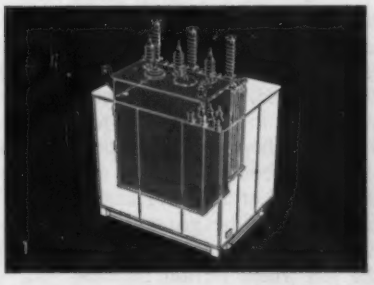
A contoured unit is available for residential areas; with all equipment enclosed in a steel cabinet, high- and low-voltage leads enter through the bottom, and overhead structures are eliminated.

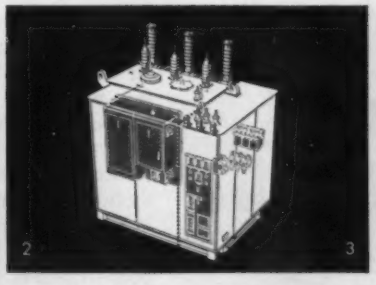
The Westinghouse CSP unit substation is a prime example of how PLOWBACK OF EARNINGS into vast engineering facilities is helping to solve your everyday electrical distribution problems — now, and for the future. For the complete story of its advantages, call your Westinghouse representative; or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

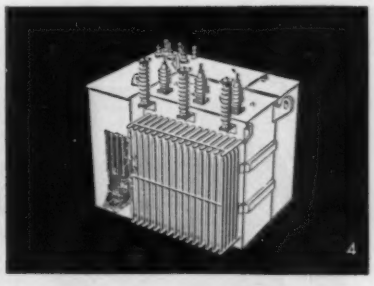
J-70878

YOU CAN BE SURE...IF IT'S

Westinghouse







CSP unit consists of (1) completely sealed coreform transformer — all gauges, valves and protective devices contained within the substation housing; (2) load tap changer — accurate, automatic voltage regulation; (3) metering instruments and controls; and (4) De-ion® circuit breaker, which fully protects against circuit and overload damage.

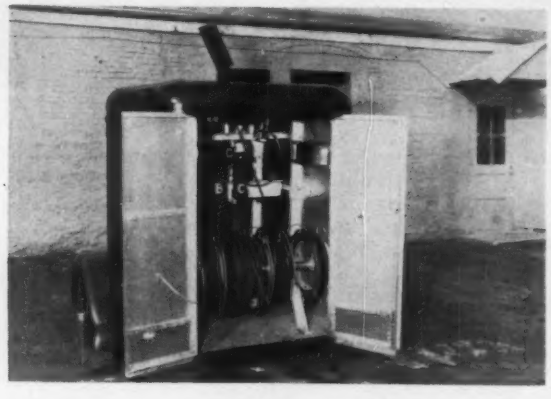
Mr. Terry W. States, Westinghouse representative, explains the flexibility advantage of the contoured Westinghouse CSP unit substation.

Mobile 75-Kva Unit Provides Flexibility

H. E. TUTHILL, Division Operating Supt., New York State Electric & Gas Co, Ithaca, N. Y.

Two enclosed two-wheel trailers, each containing a 75-Kva, single-phase, pole-type distribution transformer, have proven valuable to New York State Electric & Gas Corp. Their principal use is to provide:

1. Prompt restoration of service in the event of serious transformer overload or failure.
2. Continuous service during the replacement of transformers where a pre-arranged interruption cannot be scheduled conveniently.
3. Service for temporary short-time loads of a special nature.



4. Temporary 3-phase power, using two mobile units.

The enclosed trailer body is 72 in. long x 48 in. wide x 62 in. high. Overall length including tongue is 10 ft. A standard 75-kva, 2400/4800-120/240-v, single-phase distribution transformer with four primary bushings is used. The four bushings permit external switching for use on either 2400- or 4800-v primaries.

Primary leads are No 6 extra-flexible 5000-v cable, each 60 ft long. The three secondary leads are 50-ft lengths of 3/0 extra-flexible 600-v cable. Each cable is stored on a reel when not in use. The five reels were fabricated from discarded automobile wheels. Parking lights are provided for the trailer body. When the trailer is towed by a truck at night these lights are energized by the truck battery. They are supplied by a dry-type transformer when the unit is in service.

Transformer leads are brought out through the top of the trailer for convenience and safety to the public. When in use, the trailer body is grounded and the trailer tongue is lashed to the transformer pole with a stay chain.

Experience indicates that these units are used at least ten times as often for single-phase applications as for 3-phase. The single-phase units, when compared to a 3-phase mobile unit, offer flexibility, are easier to tow and maneuver, and require a smaller space for parking. Each unit weighs approximately 2,700 lb and costs about $2,500.

Hydraulic Jack Straightens Leaning Poles

ARDETH SMITH, Lineman "B", Indiana & Michigan Electric Co, Muncie, Ind.

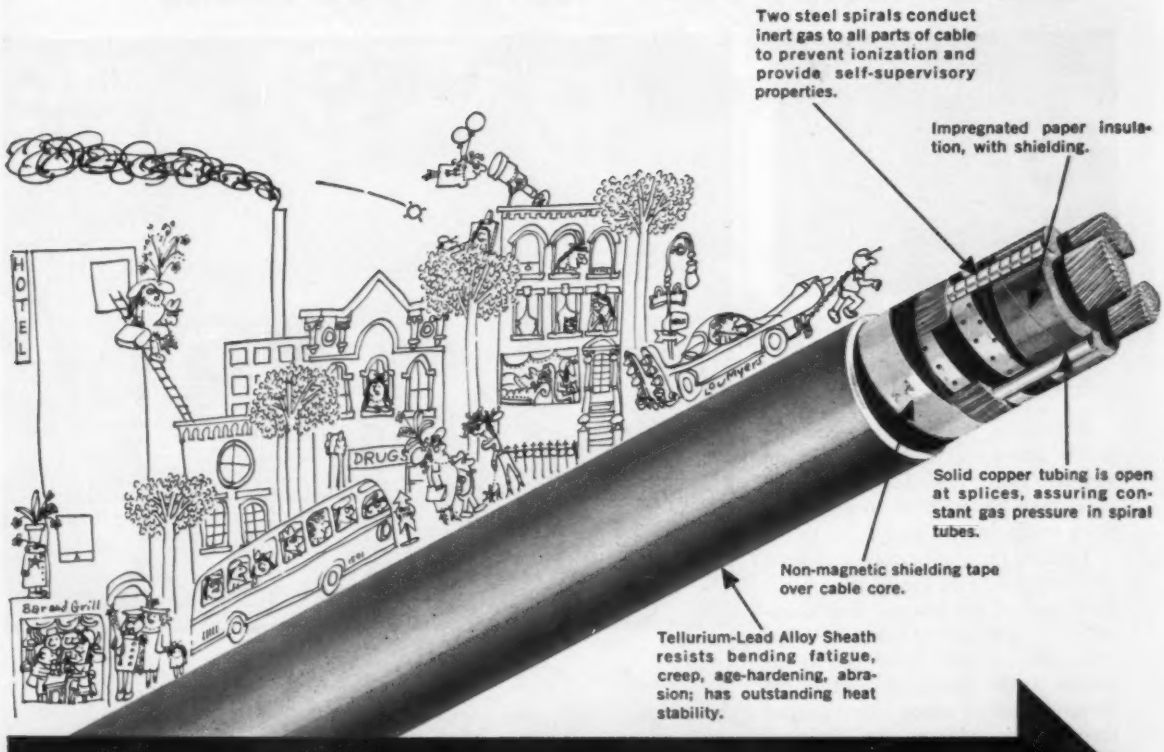
A hydraulic truck jack, attached to a length of steel pipe, straightens leaning poles quickly and safely for Indiana & Michigan Electric Co. Scrap metal may be utilized in building the inexpensive tool.

The pole jack is constructed from a 7-ft section of an old 3½-in. derrick leg with a 4 x 3½-in. angle iron welded to the foot end. A 5 x 7-in. channel iron with stops is welded to the other end to hold the jack. The bracket which fits against the pole is made by welding a 2-in. pipe about 1 in. long onto a saw-tooth metal plate mounted at a 45-deg angle.

Either the truck floor or the ground may be used to support the jack. Using a truck as a back-up support simplifies the job where terrain permits.

Formerly, it was often necessary to push a leaning pole with the truck when the pole could be approached from only one side. On rough terrain or when the truck engine failed, this was dangerous because of whipping of live conductors.

(*More How To on page* 86)


Two steel spirals conduct inert gas to all parts of cable to prevent ionization and provide self-supervisory properties.
Impregnated paper insulation, with shielding.
Solid copper tubing is open at splices, assuring constant gas pressure in spiral tubes.
Non-magnetic shielding tape over cable core.
Tellurium-Lead Alloy Sheath resists bending fatigue, creep, age-hardening, abrasion; has outstanding heat stability.
HOTEL
DRUGS
Bar and Grill

KEEPS UPHILL POWER "ON THE LEVEL"!

ROEBLING GAS-FILLED CABLE

What happens when solid-type cable is used on steep grades? If you've used it, you know! The oil impregnant simply obeys the law of gravity and drains to the bottom of the grade. At the low point, hoop stress (caused by oil pressure build-up) makes the lead sheath stretch. Eventually a rupture occurs. And in the areas drained of oil, ionization takes place.

What's the answer to this constant (and inevitable) problem? *Roebling Low-Pressure Gas-Filled Cable*—for voltages up to 46 kv! Dry nitrogen gas, inside this cable at approximately 12 psi pressure, provides consistent dielectric properties throughout the length of the cable. No matter how steep the grade, internal pressure is uniform everywhere.

Another feature of this cable is that it is self-supervisory—an alarm system lets you know if there's trouble along the line.

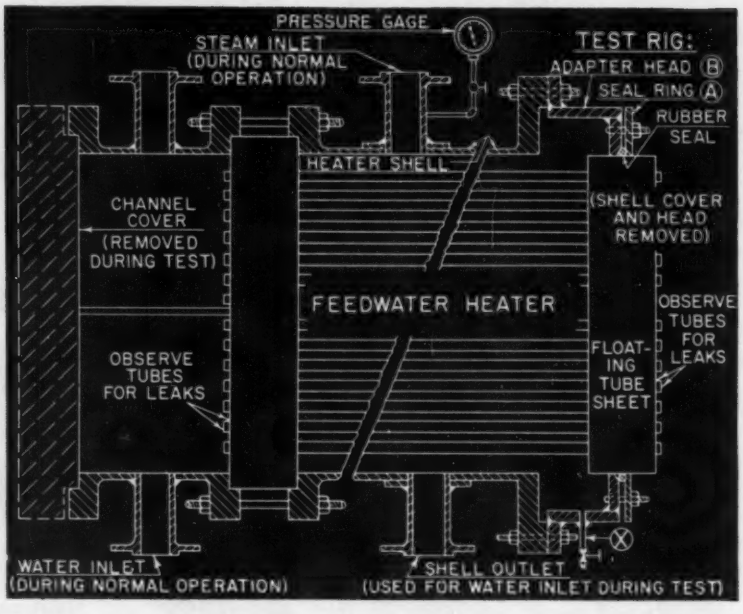
Roebling Low-Pressure Gas-Filled Cable is as easy to splice as solid-type paper power cable. It offers the least expensive long-term answer to the problem of transmitting power uphill! Get the whole story from your Roebling Field Representative soon. Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities • Subsidiary of The Colorado Fuel and Iron Corporation

Adapter Helps Spot Heater Tube Leaks

J. B. OSBOURN, Pipe Maintenance Man, Windsor Plant, Beech Bottom Power Co, Power, W. Va.

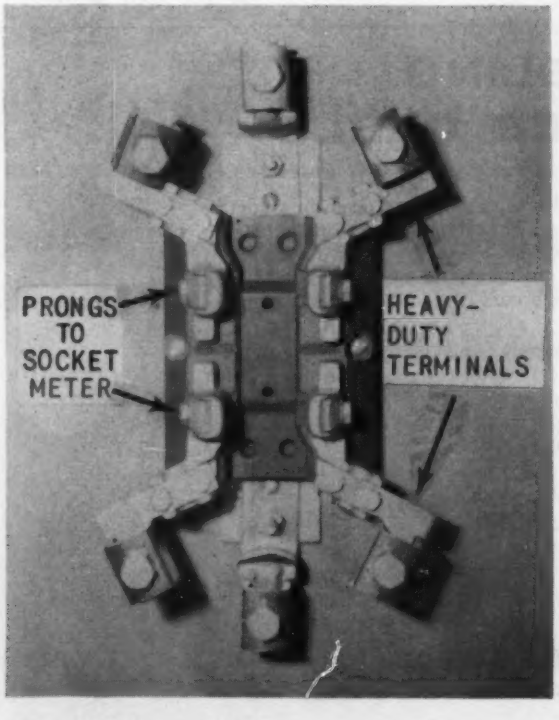


Improved testing of feedwater heater tubes results from using an adapter head and seal ring. All tubes may be tested at once and repairs made immediately.

To test, the shell cover and head are removed from the floating-tube-sheet end of the heater. The channel cover is removed from the other end. The adapter head (B) is attached to the flange, permitting the floating tube sheet to project through the adapter-ring opening. A ½-in. round rubber seal is wrapped around the tube sheet and pressed against the beveled edge of the adapter. This seal comes in a standard roll and is cut to fit, then cemented together at the ends.

The outer ring (A) of the adapter is then bolted into place to complete the waterproof seal.

About 2 hr is required to install the adapter. Total cost is about $300 for material and labor to design and fabricate.



Meter Socket Change Saves $100

L. C. KOCH, Meter Engineer, and **J. C. THOMAS**, Division Meter Superintendent, Ohio Power Co, Lima, Ohio

Expense of metering residences wired with oversize conductors can be cut by using a socket adapter developed by the Ohio Power Co. Using the adapters instead of current transformers, the company saves $100 per installation.

A 5x15x24-in. box was fabricated and a manufacturer produced a variation of the standard 200-amp socket with enlarged terminals to fit the 500-Mcm wire. The present cost of the socket adapter is about $50.

Because more contractors are using heavier conductors in anticipation of future loads, the oversize-wire problem is arising frequently. The adapter permits the use of 200-amp extended-range single-phase meters on wiring up to 500 Mcm where conventional sockets stop at 4/0. It also reduces test requirements to every eight years in the mobile meter laboratory instead of every two as required for transformer-connected meters.

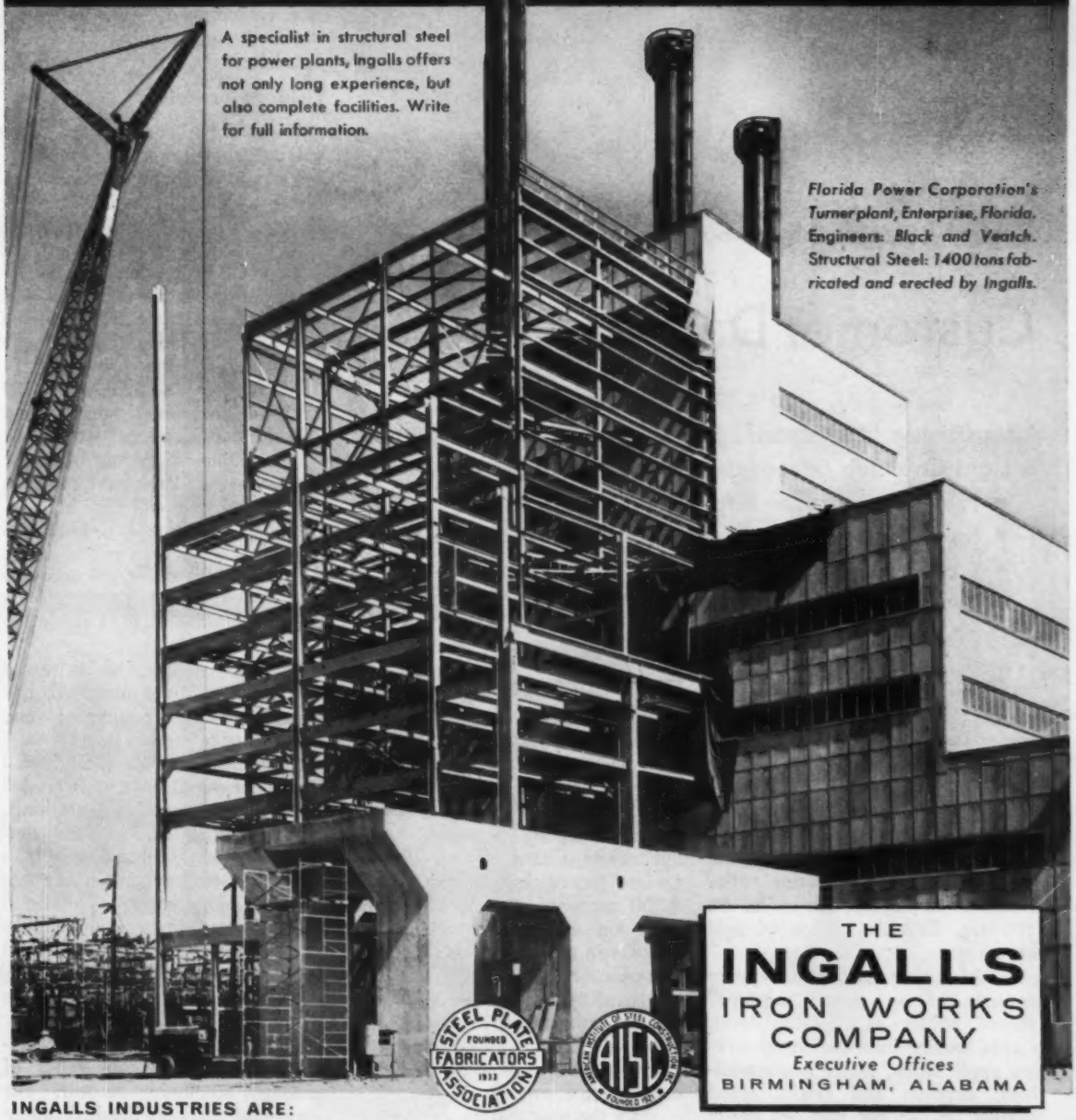
For Florida...Another Power Plant Expansion

STRUCTURAL STEEL

Fabricated and Erected by INGALLS

Expansion of the Turner plant of Florida Power Corporation at Enterprise, Florida, is another in the long succession of fabricated and erected structural steel installations by Ingalls for 46 of the nation's leading power companies.

A specialist in structural steel for power plants, Ingalls offers not only long experience, but also complete facilities. Write for full information.



Florida Power Corporation's Turner plant, Enterprise, Florida. Engineers: Black and Veatch. Structural Steel: 1400 tons fabricated and erected by Ingalls.

STEEL PLATE FABRICATORS ASSOCIATION FOUNDED 1933

AISC MEMBER NATIONAL INSTITUTE OF STEEL CONSTRUCTION FOUNDED 1921

THE INGALLS IRON WORKS COMPANY
Executive Offices
BIRMINGHAM, ALABAMA

INGALLS INDUSTRIES ARE:

The Ingalls Iron Works Company, Sales Offices: New York, Pittsburgh, Chicago, Houston, New Orleans, Atlanta • **The Ingalls Steel Construction Company,** Sales Offices: New York, Chicago, New Orleans, Pittsburgh, Houston, Atlanta • **Birmingham Tank Company,** Sales Offices: New York, Pittsburgh, Chicago, Atlanta, New Orleans, Pascagoula
The Ingalls Shipbuilding Corporation, Shipyards: Pascagoula, Mississippi; Decatur, Alabama Sales Offices: New York, Chicago, Washington, Houston, New Orleans, Atlanta

Central P&L's visible accounting system provides . . .

Customer Data at a Glance

It's a simple little system, but here's what Central Power & Light Co's "tub of records" does:

- **Provides customer information faster**
- **Saves posting time**
- **Saves office space**
- **Reduces installation costs**

A new vertical visible accounting system that simplifies posting to customer service records was recently installed by Central Power & Light Co in 69 of its south Texas local offices.

"The new system saves posting time, saves office space, and makes the entire posting operation easier for our employees," says R. R. Boerner, CP&L's auditor of field accounts.

CP&L's new accounting system consists of an open "tub-type" record holder at desk-top level. Cards bearing information on service applications, meter route numbers, deposits and credit, stand upright in the file and are easily accessible.

"One big advantage of this new system is that the filing clerks can complete their entire posting operation without getting up from their desks," Boerner said.

Replaces Tray and Box Files

The company previously used flat tray type card files for all customers' records in offices with over 2,000 accounts. Box files held records on service applications and deposits in offices with under 2,000 accounts. Posting to the flat tray type card files was time-consuming, Boerner pointed out, as the tray had to be pulled out, cards lifted and the proper card located. Postings were often made at awkward angles.

With the new system, customers' names are typed on tabs on the edges of the file cards and are easily located. When the proper card is found, it is removed from the file, posting is made on a flat comfortable working surface, and the card returned to the file.

CP&L first installed the new system at its Victoria, Texas, office on an experimental basis in 1953. Results were so good that after a one-year test period, the company decided to introduce this system into all its local offices.

Conversion to the new equipment has now been completed in all offices except one. No difficulties were encountered, either in converting to the new equipment or in its operation.

Yields "Plus Values"

There have been several "plus values" from its use.

"We have found it easier and faster to draw a balance on the deposit record," Boerner points out. "It is much easier to expand and index with the new system. Information on a customer's account can be secured quicker because of the ease in locating the card and the greater visibility provided."

Installation cost of the vertical system is less than for the flat-tray type files because more cards can be filed in a smaller amount of space. In most cases, a large increase in the number of accounts can be handled without installing additional equipment.

CP&L had about 9,600 accounts served from the Victoria office when the system was installed there five years ago.

"Today that figure has increased to 12,500 accounts and we're still using the same equipment—and have plenty of room," Boerner said. With the flat-tray system, additional equipment would have been needed to handle the additional accounts.

"The initial cost of the new equipment was so much less than for the flat-tray system that it was practical and economical to install the new system in even our smallest offices," Boerner explained. "And as our offices have grown, we've made even greater savings on our investment."

Each CP&L office using the system maintains a complete set of customer accounting records. The number of accounts handled ranges from 1,000 in the smallest office to 13,000 in the largest.

VERSATILE

RT&E

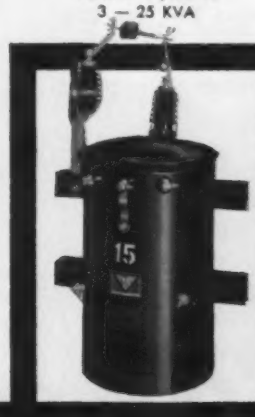
Designs distribution transformers in standard and special styles to meet all requirements

Conventional
2400 V. — 25 KVA
Typical Construction
4800 V. and below
5 — 25 KVA

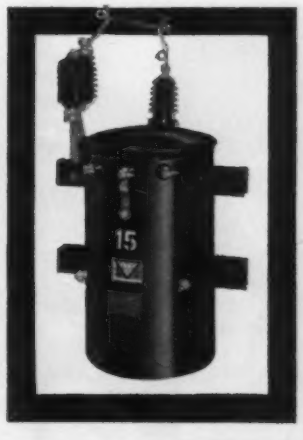
Completely Self Protected
7200 V. — 15 KVA
Typical Construction
7200 V. thru 14,400 V.
3 — 25 KVA

Duplex
7200 V. — 10/15 KVA
Typical Construction
7200 V. — 7620 V.

Protected with Double Gap and Loadguard
7200 V. — 15 KVA
Typical Construction
7200 — 14,400 V.
3 — 25 KVA

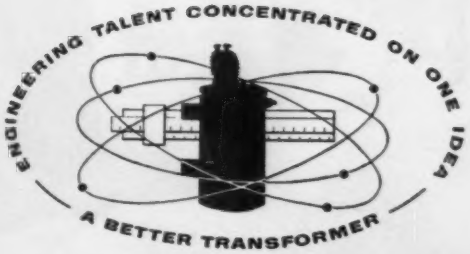


Protected with Arrester and Loadguard
7200 V. — 15 KVA
Typical Construction
7200 V. — 14,400 V.
3 — 25 KVA



Dual Voltage
2400 V. x 7200 V. — 10 KVA
Typical Construction
Combinations thru 14,400 V.
5 — 25 KVA

Conventional
7200 V. — 100 KVA
Typical Construction
7200 V. — 14,400 V.
75 — 100 KVA



RT&E CORPORATION
WAUKESHA, WISCONSIN • PORTLAND, OREGON

V

ROCKY ROAD to winning A.A.U. formula is explained to some 175,000 viewers by Denver-Chicago Truckers' coach

PUBLIC RELATIONS, appliance sales both benefit from look at local scene; in this instance, PSC's Arapahoe plant

Behind-Scenes TV Wins Top Award

Poking into other's affairs more often than not promotes the risk of being poked back. But for Public Service Co of Colorado, an inquisitive look into Denver's manners, mores and institutions has, instead, won friends and boosted appliance sales.

PANORAMA LIMELIGHT focuses briefly on recuperating heart patient during visit to Colorado General Hospital

This anomaly is attributed to a PSC-sponsored live television series, "Panorama." A Tuesday night half-hour show, it has in little over a year's time built up an audience of 150,000 to 175,000 viewers. Critics like it also; the show was named winner recently of the George Foster Peabody Award for distinguished and meritorious public service.

A brainchild of KLZ-TV, Denver's CBS affiliate, Panorama has visited hospitals, schools of theology, industries, museums, and a PSC power plant. Special reports on human relations have included the city's parole system, a tour of skid-row, teen-age problems, and the plight of unwed mothers. Hundreds of letters arrive each month with suggestions for future telecasts.

"Panorama is proving itself a powerful vehicle for selling electrical items and appliances, just as it has already proved its public relations value," says Don Spangenberg, PSC advertising director.

Desiring to steer clear of a "who-done-it or a western," PSC latched on to the program when the KLZ staff proposed it, Spangenberg explains.

"Within three months a survey showed we were reaching the audience we wanted—people in the higher income and education level," he says.

The utility decides what subjects will be dealt with in conferences with KLZ. Sitting in for PSC are Robert T. Person, executive vice president of advertising and publicity; Spangenberg; and Bob Janke, who writes relaxed, "sound sell" commercial copy that comes midway in the program.

It costs PSC $750 a week to produce Panorama, which includes the overall total cost for time, talent for commercial messages, and related expense. The show is written and narrated by Gene Amole and directed by James Lannon, both of the KLZ staff.

Thermalastic insulation sets reliability record

ANOTHER PRODUCT OF EARNINGS PLOWED BACK

Faced with sharply rising operating costs, electric utilities know they can't rest on a plateau of efficiency. To continue bettering their performance, they demand more capacity, more reliability in new generating equipment . . . advances that come only through intensive research efforts.

By plowing back earnings into a program of pure and applied research, Westinghouse has developed many such advances, as typified by Thermalastic® insulation. The record: *Since 1949, Thermalastic insulation has assured the trouble-free operation of more than one-half million coils in electrical apparatus such as generators and large motors.*

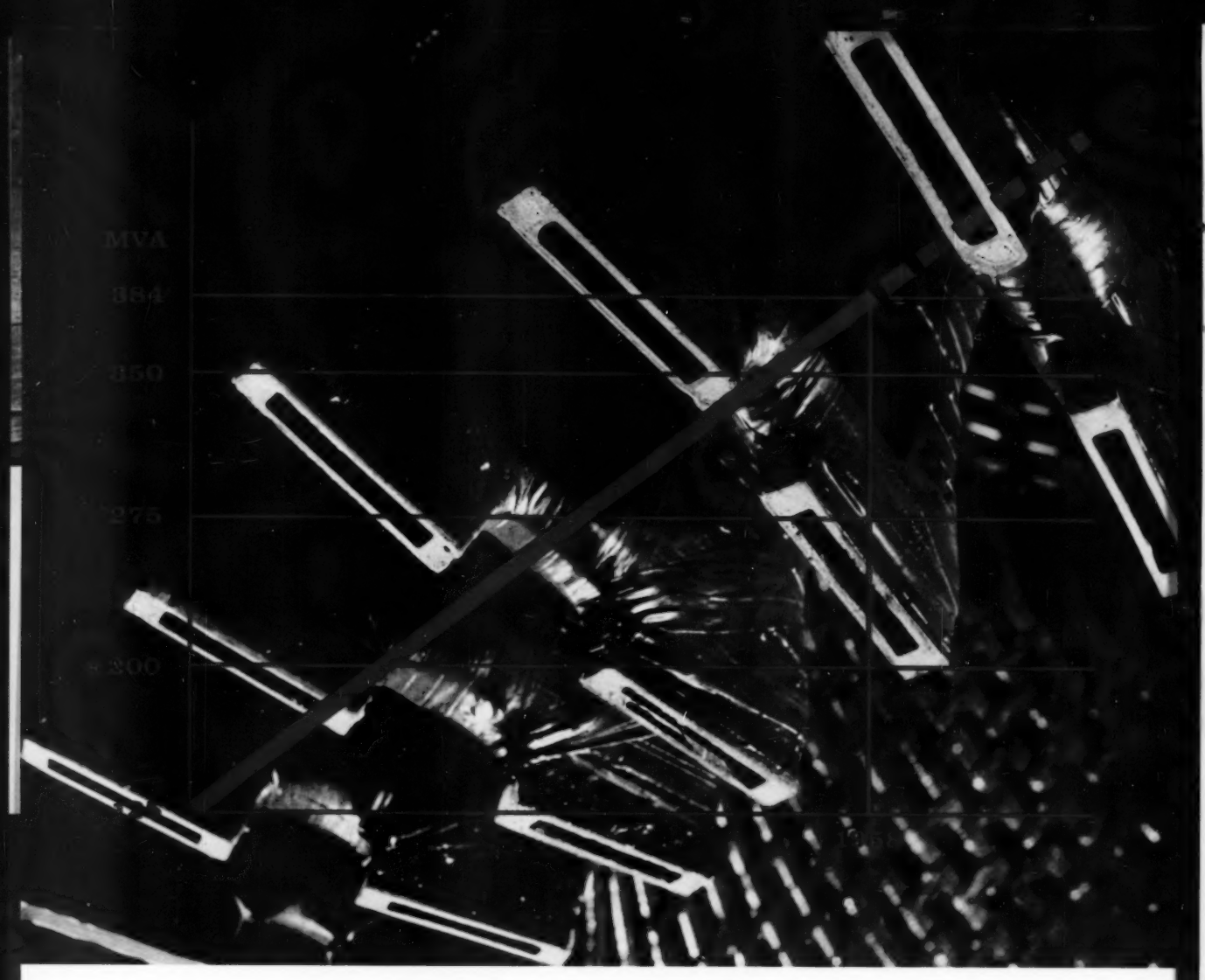
More than 6,000 scientists, engineers and technicians in Westinghouse research and development laboratories are at work developing and perfecting new techniques, materials and products such as Thermalastic insulation. This reinvestment in research is helping utilities produce more electricity at less cost.

For a new booklet describing the Thermalastic insulation system, write to Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

Voltage tests prove that Thermalastic insulation has a 1000-to-1 advantage. Operating voltages can't get through the fish-scale barrier of large mica splittings . . . locked in a memory-type elastic bond.

YOU CAN BE SURE...IF IT'S

Westinghouse



THROUGH PLOWBACK OF EARNINGS INTO RESEARCH . . .

Westinghouse hydrogen inner-cooled generators set world's capacity record

A 384,000-kva hydrogen inner-cooled generator, now under construction at Westinghouse, will soon break the world's capacity record. The largest capacity generators *operating* today are two 319,445-kva rated units, also Westinghouse hydrogen inner-cooled.

Westinghouse succeeded in developing and introducing hydrogen inner-cooling of both stator and rotor windings of large turbine generators after plowing back millions of dollars into research and engineering.

This method of cooling generators has made possible the large ratings that are common . . . and necessary . . . today.

When even larger ratings are needed, Westinghouse will provide them with the same hydrogen inner-cooled system, proved reliable by more than 3,200,000 kva already in service.

Hydrogen inner-cooling is a typical result of Westinghouse research . . . research that provides electric utilities with *advanced* generating equipment. Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

JI-97229-2

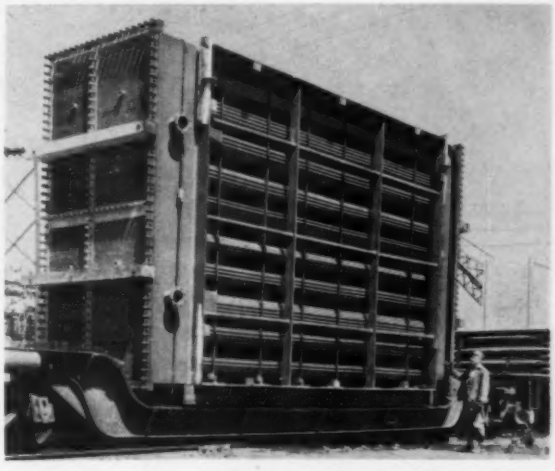
YOU CAN BE SURE...IF IT'S Westinghouse

Allis-Chalmers Ships Large Condenser With Tubes Installed

Containing almost 25 miles of tubes (5,460 tubes, each 24 ft long) the largest Allis-Chalmers condenser shipped to date completely tubed recently left the West Allis, Wis., Works. Buyer of the 30,000-sq ft, two pass unit is the Otter Tail Power Co, Fergus Falls, Minn. Previous record holder was a 27,500-sq ft unit sent to the City of Tacoma, Wash.

Scheduled for installation at the power company's Hoot Lake Station in Fergus Falls, the condenser will serve a 53,500-kw reheat steam turbine generator. This unit will be the second A-C condenser installed at this station.

Measurements of the shell of this unit are: 24 ft long, 14 ft, 8 in. wide and 6 ft 8¼ in. high. The neck, which was shipped separately, stands 8 ft high and is 22 ft long. It will be welded on at the installation site. The shell, complete with tubes, weighs 132,000 lb.

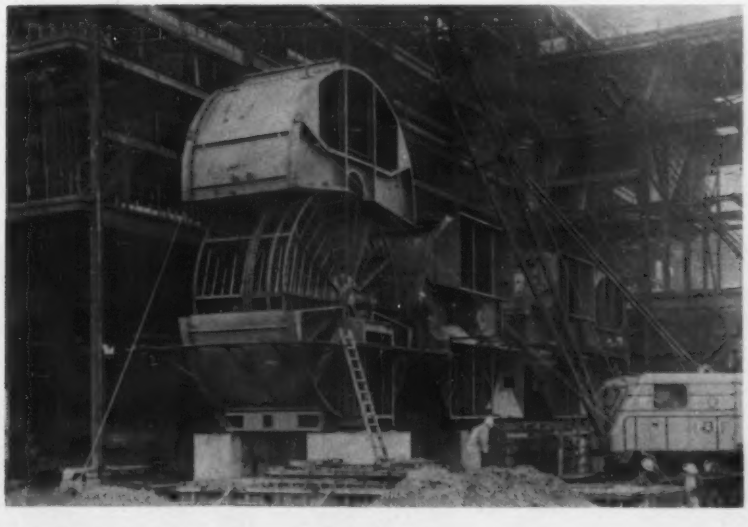


Air Preheaters Go In Bergen Station

Eight air preheaters manufactured by The Air Preheater Corp, New York, are being installed at Public Service Electric & Gas Co's new Bergen Generating Station, Ridgefield, N. J. A casing is shown being lowered on one of the preheaters.

The power company is one of the first northern utilities to use large-size horizontal preheaters, according to the manufacturer. Public Service already has nine horizontal preheaters in operation at the Linden, N. J. generating station.

The eight preheaters at Bergen will serve two boiler units, each with an evaporation of 1,900,000 lb of steam per hour. Anticipated stack temperature for the units is about 275F. The first boiler is scheduled to go into operation early next year.



Anglo-American Nuclear Manufacturing Link Formed

Babcock & Wilcox Co, New York, is to pool its "know how" with Babcock & Wilcox Ltd, a British manufacturer of steam plants for nuclear power stations.

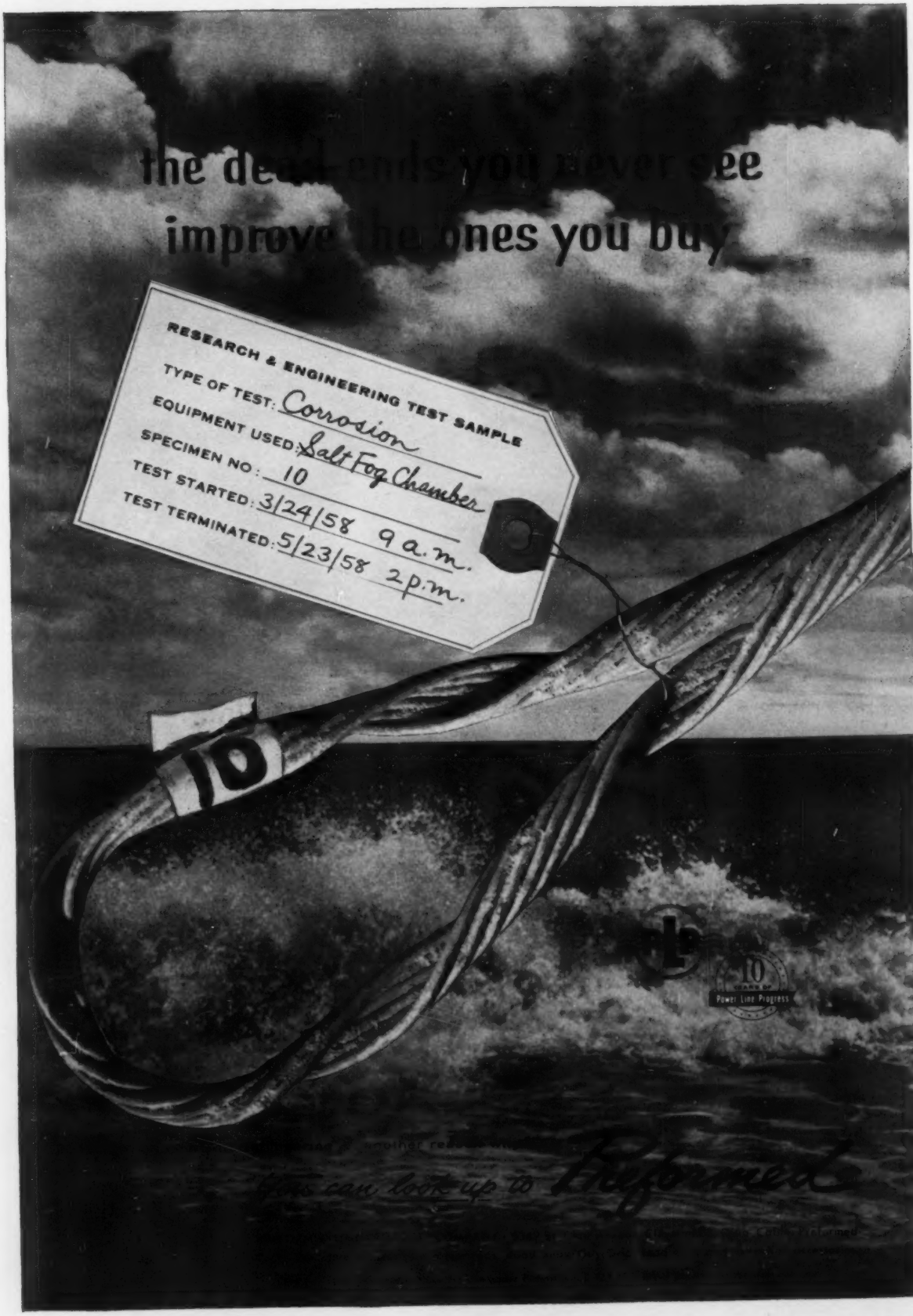
B&W Ltd, as a member of the English Electric—Babcock & Wilcox—Taylor Woodrow atomic power consortium, is making equipment for the largest nuclear power station which is being constructed at Hinkley Point, Somerset. It designed and constructed the steam raising plant at Calder Hall and Chapel Cross.

Although the British firm orginated from the American company, there has been no financial link between the two firms since 1891.

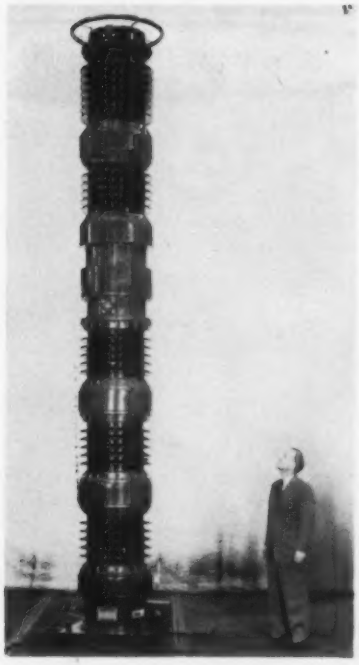
Pirelli Produces Voltalir

MILAN (McGraw-Hill World News)—A synthetic insulating material, called Voltalir, has been produced by Pirelli in its Bicocca laboratories outside of Milan. Insulators, cable joints and terminals, capable of standing voltages as high as 400 kv, can be made of the material.

(*More Manufacturers News, page* 95)


the dead ends you never see
improve the ones you buy
RESEARCH & ENGINEERING TEST SAMPLE
TYPE OF TEST: Corrosion
EQUIPMENT USED: Salt Fog Chamber
SPECIMEN NO: 10
TEST STARTED: 3/24/58 9 a.m.
TEST TERMINATED: 5/23/58 2 p.m.
10
10 YEARS OF Power Line Progress
Kids can look up to Linemen

GE Co Releases Apparatus Data



General Electric Co reports on development of four types of apparatus. .

• Six 345-kv "cascade" potential transformers have been produced for American Electric Power Service Co. Considered the largest of this type built, the pots are 17.5 ft high. The one shown dwarfs L. W. Marks, design engineer. But they are said to be considerably smaller, lighter, and up to 40% lower in price, than conventional potential transformers of the same rating because of reduced materials. They are designed for 115-kv and higher.

This type EU-1175 pot will provide metering and back-up relaying for the 345-kv tie line between American Electric Power and Commonwealth Edison Systems. Installation is at the Indiana & Michigan Electric's Oliver Station near South Bend, Ind.

Individual core and coils are housed in the steel sections which are separated by porcelain insulators. Auxiliary windings are interconnected to force an equal division of the voltage. Secondary voltage is taken off the bottom section.

• Two 62,500-kva synchronous condensers have been manufactured for Commonwealth Edison Co, Chicago, to control 345-kv transmission power. Each unit is rated at 30 psi hydrogen, 12.6-kv, 10-pole, 3-phase, 60-cycles. They are tied into each of two 345-kv lines which form an interconnection between the American Electric Power Service Co's Indiana & Michigan Electric Co substation at New Carlisle, Ind., and Commonwealth Edison Co substation at Goodings Grove, Ill.

• A 20,500-kw, 13.8-kv gas turbine is offered for low-cost peaking service. Available for gas or distillate oil fuels, the unit is equipped with a high flow compressor and is suitable for operation at 1,600F firing temperature. It is developed from the 16,500-kw, simple-cycle, single-shaft gas turbine with combustion and turbine modification.

• A new type motor that will run under water will be announced soon by the Medium AC Motor and Generator Dept. The motor will be completely submersible by allowing internal circulation of water through the electrical and mechanical components. A special insulation system is the major factor contributing to the development of the motor. One application may be internal boiler water circulation.

L-M Accepting Quantity Orders on SRTs

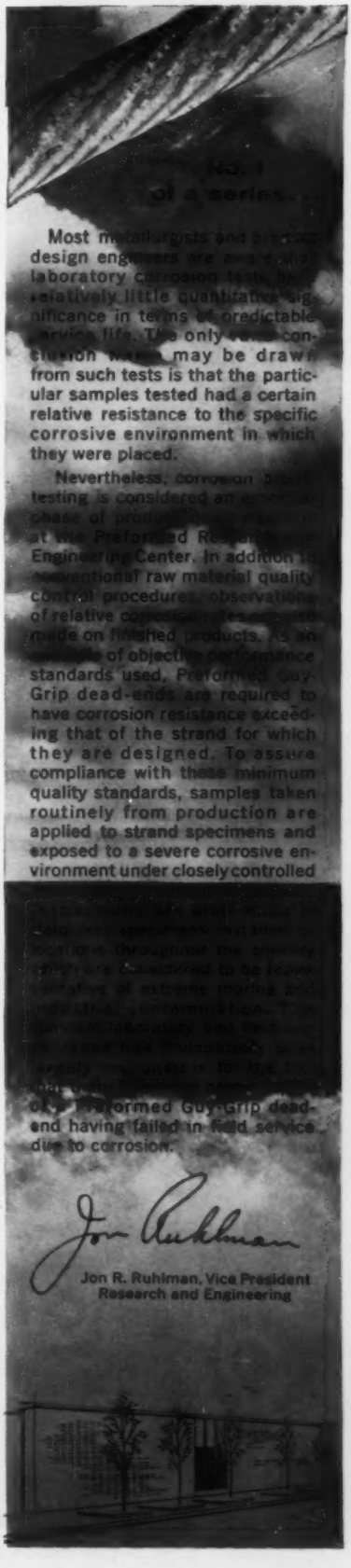
Quantity orders for Line Material Industries' newly developed self-regulating distribution transformers are now being accepted by the company on an "as received" basis. SRTs will be produced in ratings of 2,400 to 14,400 v inclusive and 10 through 100 kva.

The nominal secondary voltage of SRTs can be set at 120 or 123v. All orders should specify the setting desired. The regulation range of 10% can be manually selected for effective SRT operation at any point on a primary feeder.

So Cal Ed Orders 64.6 Mw Units for Hydro-plant

Two 64,600-kw waterwheel generators were awarded on an approximately $2-million order to Westinghouse Electric Corp by Southern California Edison Co. The

(*Continued on page* 96)


Most metallurgists and
design engineers are
laboratory corrosion tests
relatively little quantitative
nificance in terms of predictable
service life. The only
may be drawn
from such tests is that the particular samples tested had a certain relative resistance to the specific corrosive environment in which they were placed.
Nevertheless, corrosion
testing is considered an
phase of
at the
Engineering Center. In addition
conventional raw material quality
control procedures, observations
of relative
made on finished products. As an
of objective performance
standards used, Preformed Guy-Grip dead-ends are required to have corrosion resistance exceeding that of the strand for which they are designed. To assure compliance with these minimum quality standards, samples taken routinely from production are applied to strand specimens and exposed to a severe corrosive environment under closely controlled
Preformed Guy-Grip dead-end having failed in field service due to corrosion.
Jon R. Ruhlman, Vice President
Research and Engineering

PORTABLE TEST INSTRUMENTS by CURTISS-WRIGHT

made under licensing agreements with one of Germany's leading instrument manufacturers

INSULATION and Earth Resistance TESTERS

up to 5000 Volts in 5-lb. Package

The extremely compact and rugged insulation testers have a built-in, hand-cranked voltage generator. New design low-torque hand-crank. A patented mechanical rectifier permits generation of up to 5000V. ±1.5% accuracy. Length of scale 2¾". Available in eight models.

MODEL NO.	TEST VOLTAGES	MEASURING RANGES	
8001	500V	0-50 megohms	0-260V 0-520V
8002	100V 500V	0-10 megohms 0-50 megohms	Four low ranges:
8003	250V 500V	0-25 megohms 0-50 megohms	0-200 ohms 0-2,000 ohms
8004	500V 1000V	0-50 megohms 0-100 megohms	0-20,000 ohms 0-200,000 ohms
8005	625V 1250V 2500V	0-100 meg. and 6.5-500 meg. 0-200 meg. and 13-1000 meg. 0-400 meg. and 26-2000 meg.	
8006	2500V 5000V	0-500 meg. and 24-2000 meg. 0-1000 meg. and 48-4000 meg.	
8007	For earth resistance measurements	0-2 ohms 0-10 ohms 0-100 ohms	0-1,000 ohms 0-10,000 ohms
8008	For measuring earth resistivity (ohm-cm) and earth resistance	0-2 ohms 0-10 ohms 0-100 ohms	0-1,000 ohms 0-10,000 ohms

PORTABLE BRIDGES and MULTIMETERS

MODEL 7009 Wheatstone Bridge

Accuracy and portability combined with simple operation—one range switch, one large dial. Ideal for all electrical and electronic work.

Model 7009 Wheatstone Bridge has a total range of 0.05 to 50,000 ohms divided in five ranges. ±0.5% to ±2% accuracy depending on range used. Can also be used with external a-c test voltage and scope null detection for higher sensitivity of null.

Model 7010 Kelvin Bridge has four ranges covering total range of 0.0001 to 2 ohms. ±1% to ±2% accuracy depending on range used.

MODEL 7001 Multimeter

Model 7001 Multimeter is an extremely rugged, versatile, and accurate AC-DC current and voltmeter with 20 ranges (up to 6 A a-c!), including ohm scale for continuity testing and calibrated scale in foot-candles for light measurements. Uses selenium light cell for power. ±1% accuracy.

Model 7002 R-C Meter is a handy pocket R-C meter with ±1.5% accuracy for the resistance scale. Individually calibrated ranges (3) covering 5 to 1,000,000 ohms and 0.5 to 2,500 mfd. Uses 1.5V battery. Scale length 1¾".

For complete information, write Electronic Equipment Department.

ELECTRONICS DIVISION
CURTISS-WRIGHT
CORPORATION • CARLSTADT, N. J.

So Cal Ed Orders

(*Continued from page* 95)

machines will be installed at the utility's Mammoth Pool hydro-electric generating station on the San Joaquin River about 50 miles northeast of Fresno. The generators, dam gates and other electrical and mechanical apparatus will be controlled remotely by push buttons and microwave system from another powerhouse in the Big Creek project.

The generators are scheduled for delivery in June and August, 1959. Mammoth Pool, first large outdoor hydro-electric plant on Edison's system, is expected to be completed by May, 1960.

S. Morgan Smith Co, York, Pa., has the order for the 88,000-hp waterwheels to operate at 360 rpm and 950-ft average head. (EW, July 14, 1958, p 81).

MANUFACTURERS BRIEFS

Hubbard & Co will consolidate the manufacture of pole line hardware at its Chicago and Oakland, Calif., plants. By this step the company states that it is afforded the advantage of locations for plant expansion, with subsequent improvement in customer service. Also, the warehouse and shipping facilities at Plano, Texas, have been improved by additions for expansion.

Leeds & Northrup Co, North Wales, Pa. is building a $1.7 million, 65,000 sq ft scientific research center. Completion is scheduled for next spring.

Motorola, Inc, Chicago, along with two public mobile radio service operators, and three mobile radio maintenance organizations, on July 24 filed a petition with the Federal Communications Commission asking for an investigation into the operation and regulation of public land mobile radio stations and services. The petition questions whether major landline telephone companies should be permitted to engage in mobile radio service, and if so, how they should be regulated in the public interest.

reflective markings end danger after dark

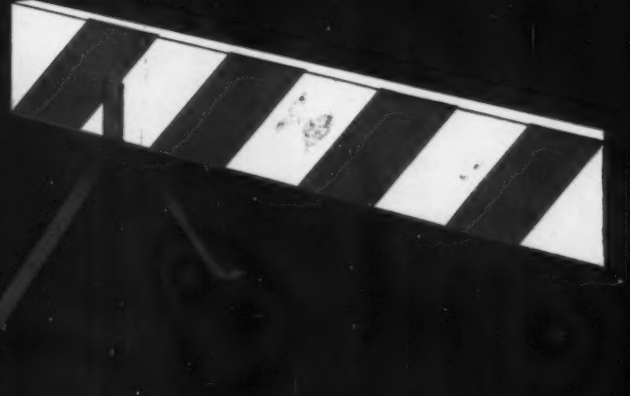
Where there is danger, colorful markings of bright "Scotchlite" Reflective Sheeting flash a vivid warning to nighttime motorists. These durable, low-cost markings protect your own equipment, too. You show your concern for public safety. And you remind the public of your vital 24-hour-a-day service. Send for informative free booklet today.

REG. U. S. PAT. OFF.

SCOTCHLITE

BRAND

REFLECTIVE SHEETING



MINNESOTA MINING AND MANUFACTURING COMPANY
where RESEARCH is the key to tomorrow

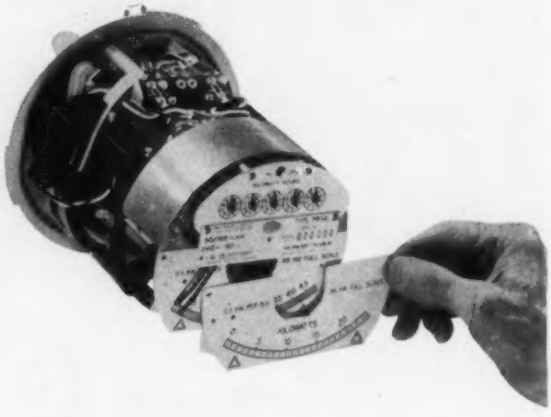
PRODUCT OF 3M COMPANY RESEARCH

The term "Scotchlite" is a registered 3M Company trademark

FOR **FREE** BOOKLET ON REFLECTIVE MARKINGS, WRITE 3M COMPANY, DEPT. QW-848, ST. PAUL 6, MINNESOTA

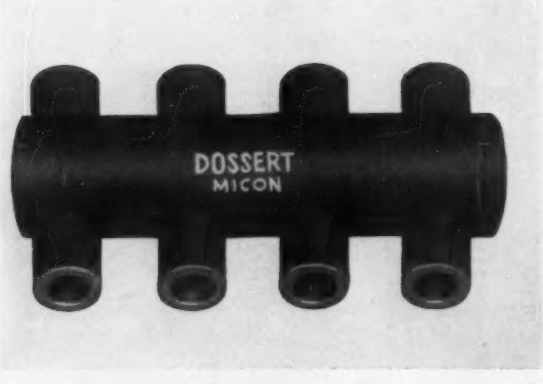
New Equipment

Watthour Demand Meter . . .



. . . for locations where future load growth is anticipated has dual range feature that permits doubling capacity of demand element by simply changing two link connectors and interchanging demand scales. Meter does not have to be recalibrated when changing range. This polyphase watthour/watt thermal demand meter, designated the Lincoln Type PW, is available with dual ranges of 24 and 48 kw in the Class 100, and 48 and 96 kw in Class 200. Meters are also offered with universal scales and multiplier plates marked according to selected range.

Sangamo Electric Co, Springfield, Ill.



Underground Connector . . .

. . . joins 2 to 18 cables in watertight, fully insulated connection. Designed for distribution networks and industrial use, the Micon connector is a pre-insulated bus bar with mechanical cable receptacles for connecting cables. Insulation is molded on connector so as to eliminate tedious and time-consuming crotch taping. Insulating material may be Mypar natural rubber compound or Myprene synthetic rubber compound, both of which are designed for exceptional dielectric and aging properties. Insulation is molded without seams or factory taped joints.

Dossert Mfg Corp, 249 Huron St, Brooklyn 22, N. Y.

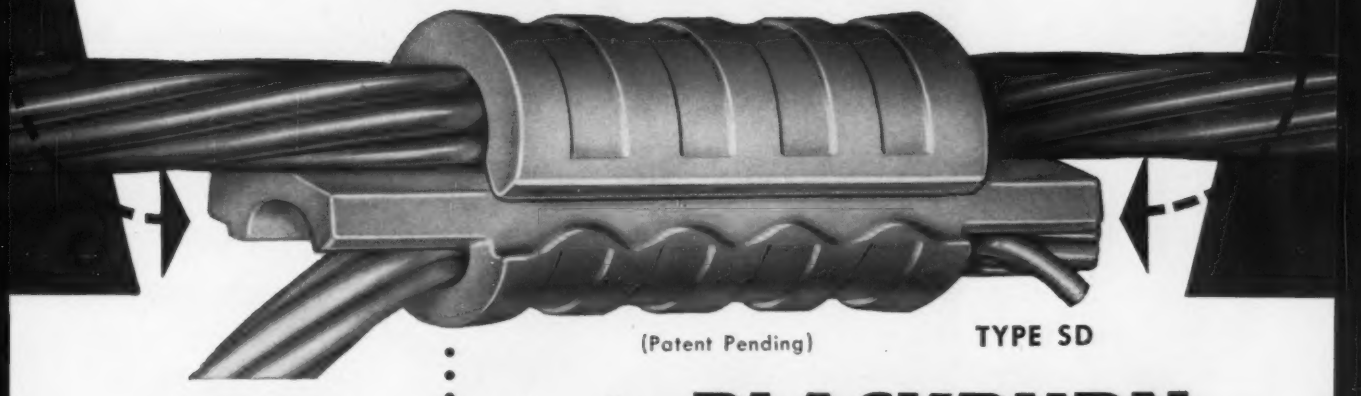
Meter Test Table . . .

. . . can accommodate two watthour meters simultaneously. This Form FRDD has two photoelectric timers which permit operator to run full load test on one meter while light load check is made on a second. Controls may then be switched to the opposite positions. Full load, light load, 50% p.f., and insulation breakdown tests may be run on single-phase and 2- and 3-element polyphase meters rated through 100 amp. Table has built-in voltmeter and voltage regulator. Meter positions are movable front and back; meter may be brought under operator's eye for close inspection. Quick contactors are furnished for both socket and bottom terminal meters.

States Co, 19 New Park Ave, Hartford, Conn.

(*More New Equipment on page* 101)

Exclusive New
DRIP-GUARD
SEPARATOR

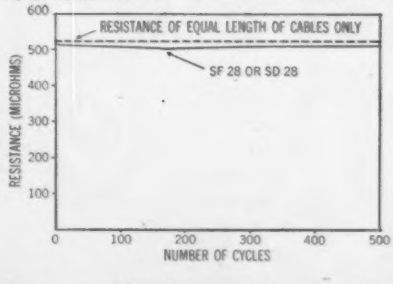


(Patent Pending) TYPE SD

in BLACKBURN 6-Frame Tap Connector

- **Assures Separation of Conductors**
- **Provides Needed *Extra* Protection on Bi-Metallic Connections**

CURRENT CYCLING TEST TELLS THE STORY



Current Cycling Test Conditions:

1. Cables: 4 Stranded Copper; 2 ACSR.
2. Cable operating temperature: 125° C.
3. Cycle: 2 hours "On", 1 hour "Off".
4. Length of connection: 24 inches.
5. Resistance of equivalent length of wire: 522 microhms.
6. Cables were wire-brushed, but no protective compound was used.
7. Curves represent an average of seven tests.

This rugged Blackburn design provides protection for conductors from both galvanic corrosion and physical damage. The Blackburn Drip-Guard Separator, plus the completely enclosed tap, prevents corrosion products from bridging the gap between the copper and aluminum conductors. Copper wire now can be used as main or tap without corrosion damage to the aluminum conductor.

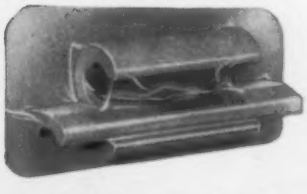
In addition, the superior Blackburn design, which incorporates external channels parallel to the tap hole, assures uniform encirclement of both conductors when compressed.

Shot-blasted surfaces protected by an oxide-inhibiting film insure oxide-free connectors at jobsite.

Type SF Recommended for Aluminum to Aluminum

This Blackburn 6-Frame Tap Connector assures complete separation and protection of the conductors. The Drip-Guard is unnecessary for this application.

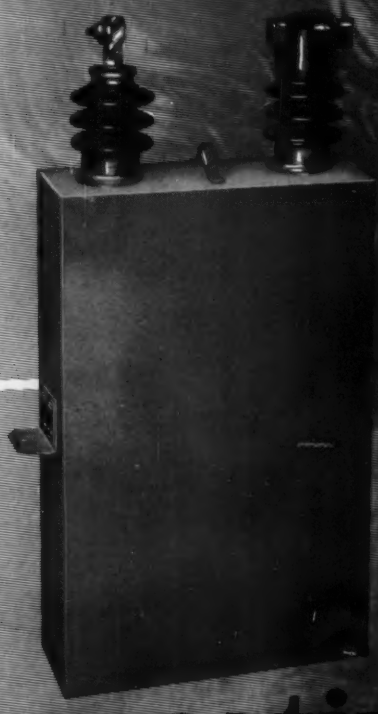
Both Designs Available *Pre-Filled*



Type SD or SF may be ordered pre-filled with Blackburn's superior oxide-inhibiting compound, Contax. Pre-filling eliminates the possibility of an installation being completed without inhibitor.

Write for samples

LIVE BETTER ELECTRICALLY

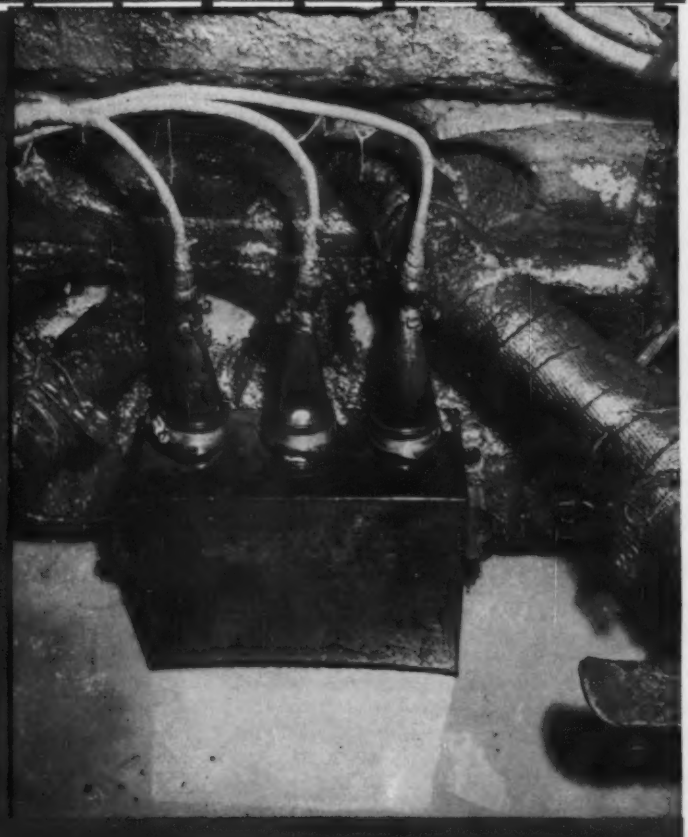


creative engineering in action

Investigate TOBE capacitors today. Available in all standard ratings; in single units, racks, pole assemblies ready for field installation and energization. Tobe offers on-the-spot engineering consultation where and when you say. Just write Tobe Deutschmann Corporation, Norwood, Mass., or phone Norwood 7-2020.

LOOK TO TOBE for creative field teamwork to meet your special requirements. Specify Tobe Tempall Capacitors for built-in features that make big difference in power factor improvement.

• Special clamp arrangement with vibration-proof nyoon-insert stop-nut on line hardware • Stainless steel case at no extra cost • Individual control of every capacitor during every step of assembly and impregnation • Discharge resistors across each series group • Losses are consistently lower than requirements



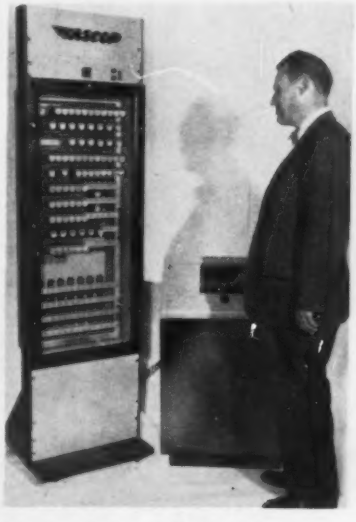
Submersible type three phase capacitors. Practically many of the capacitors used by Consolidated Edison Company are submerged in water. Installation was partially dictated by Consolidated Edison Company so cost economies of this submersible type Tobe capacitor could be taken.

TOBE TEMPALL CAPACITORS

Since 1920 pioneers in power factor improvement and manufacturers of quality capacitors

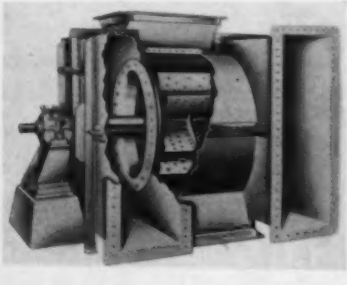
Remote Control System . . .

. . . for unattended power stations and substations provides 105 channels of control supervision and up to 30 channels of continuous telemetry over one transmission circuit. Applicable to any transmission circuit capable of passing 15 pulses per sec, it can be used with telegraph circuits, voice grade circuits, or microwave radio links. Signal sys-



tem permits automatic triple code checks, insuring integrity of transmissions and preventing wrong operation or loss of data. Less than two seconds are required for any transmission. Pulse width telemetry permits continuous data gathering over same circuit as supervisory control transmissions.

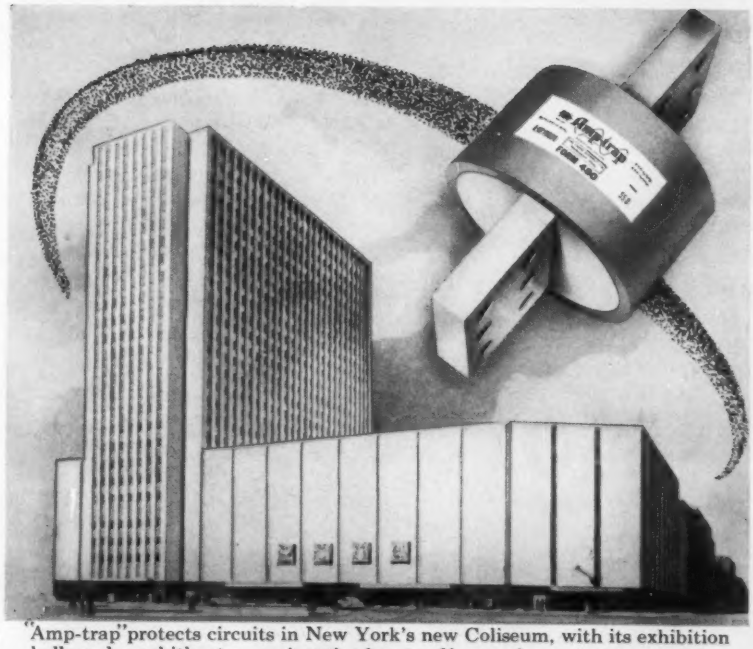
Applied Science Corp of Princeton, P. O. Box 44, Princeton, N. J.



Heavy Duty Fans . . .

. . . for handling abrasive gases at elevated temperatures can be used for steam boiler gas recirculation, fly ash precipitator purging, induced

(*Continued on page* 102)



"Amp-trap" protects circuits in New York's new Coliseum, with its exhibition halls and amphitheatre, against the danger of heavy short- circuit or fault currents, regardless of varying load requirements.

SHAWMUT'S FORM 480 Amp-trap®

FOR APPLICATION ON ENTRANCE SWITCHES, BUSWAYS, FEEDER SERVICES AND CIRCUIT BREAKERS
ON AC CIRCUITS UP TO 600 VOLTS
ON DC CIRCUITS UP TO 250 VOLTS

- Positive Protection against Super currents as high as 500,000 peak amperes available.
- Built in Ampere Ratings of 600, 800, 1000, 1200, 1600, 2000, 2500, 3000, 4000, 5000 and 6000.
- Sharp Current Limitation Characteristics for Backup Protection of Air Circuit Breakers, Switches, etc.
- Easily Adaptable into Busses, Bus Ducts or Switches.
- Economical in First Cost and Replacement.
- Very Low Watt Loss — Cool Operation.

Copyright 1957, The Chase-Shawmut Co.

OVER 60 YEARS FROM EDISON TO ELECTRONICS

480-Amp-trap® — "Awake At The Switch"

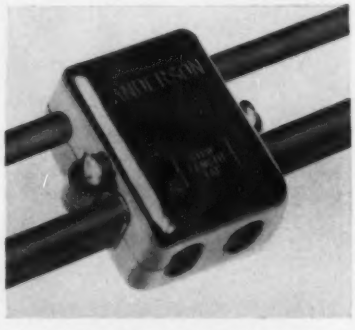
THE CHASE-SHAWMUT CO.
374 MERRIMAC STREET • NEWBURYPORT, MASSACHUSETTS
Subsidiary of I-T-E CIRCUIT BREAKER CO., Philadelphia, Pennsylvania

Amp-trap® Tri-onic® t-d® C-O-T® TRIONET® the O-T type

Heavy Duty Fans . . .

(*Continued from page* 101)

draft for waste heat boilers, or similar applications. Available in ratings from 10,000 to 500,000 cfm for pressures up to 70 inches of water, these centrifugal fans operate in range from 20 to 850 F. Designated as Series 7000, they have radial blading with heavy tapered blade sections for minimum stress of rotating parts. Unobstructed gas passage provides maximum self cleaning. They may be equipped for capacity control.
Westinghouse Electric Corp, Box 2278, Pittsburgh 30, Pa.



Mid-Span Phase Connectors

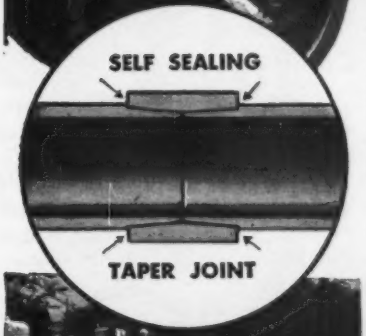
. . . for triplex or open-wire secondary tap-offs are designed to handle No. 8 to 1/0 ACSR main and No. 8 to No. 2 ACSR tap. The MSP-2 has two taps; the MSP-4, four taps. Clamp is one-piece, one-bolt design, enclosed in heavy plastic cover which clamps to insulated main cable. Insulation stripping gauge is incorporated on cover so taps can be made up and installed without disassembly of cover. Large area contacts and corrosion-proof hardware are provided by stainless steel allen-head bolts and pressure bars.
Anderson Electric Corp, Birmingham 1, Ala.

CT Test Equipment . . .

. . . facilitates testing from light load to 200% load. It has 23 current ranges, extending from 10 amp to 2,000 amp and is designed to be used with the manufacturer's current transformer comparator (EW, July 14, 1958, page 93). It con-

(*Continued on page* 104)

SMOOTH BORE!



Orangeburg Fibre Conduit Prolongs Cable Life

Protect cable sheath from abrasion and you prolong the life of underground cables, say utility engineers. Scoring of cable sheath creates "trouble spots" that shorten cable life.

That's where Orangeburg Fibre Conduit plays an important part in keeping cables healthy. Orangeburg's smooth bore, its low coefficient of friction minimize the danger of abrasion when cables are pulled in, as well as later on during cable movement. By protecting cable sheath from abrasion, Orangeburg Fibre Conduit adds years to cable life.

Orangeburg's impermeable wall and watertight joints protect cables from corrosive ground waters. Its nonmetallic material is strong, tough, resilient, long lasting.

And, remember, Orangeburg lays faster and at lower cost than other types of conduit. It is light in weight, easy to handle, easy to tool on the job. Spacers, bends, fittings, 5° bend sections and lightweight tapering tool, all combine to simplify installation.

Since 1893, records of long life have proved Orangeburg's durability and economy.

Orangeburg Fibre Conduit is distributed by Graybar Electric Company and General Electric Supply Company with branches and stocks in principal cities.

WRITE DEPT. EW-88 FOR NEW CATALOG 52.

ORANGEBURG MANUFACTURING CO., INC., Orangeburg, N. Y. West Coast Plant, Newark, Calif.

ORANGEBURG®
FIBRE CONDUIT

Here in a new substation just north of Tulsa, as in many other locations, the Public Service Company of Oklahoma uses C & D PlastiCell batteries as an always-dependable source of power for switchgear control. By opening and closing circuit breakers, operating pilot lights and control relays, C & D PlastiCell batteries help keep vital switchgear equipment on the job.

Just as the Public Service Co. of Oklahoma has found C & D PlastiCell batteries to be specifically designed and engineered for control service, you'll find they'll meet your every need for all control, switchgear and auxiliary power needs. In C & D PlastiCell batteries you get:

Dependable standby power (160 A.H.) is provided by this C & D 60-cell PlastiCell battery.

- **Long life** due to exclusive suspended and supported plate construction; extra-thick, triple insulated plates.
- **Low in-space cost** because plastic jars are lighter, break-resistant and require less space.

Write for descriptive literature on C & D PlastiCell batteries.

*Trademark

C&D BATTERIES, INC.
of Conshohocken, Pa. ... Attica, Ind.

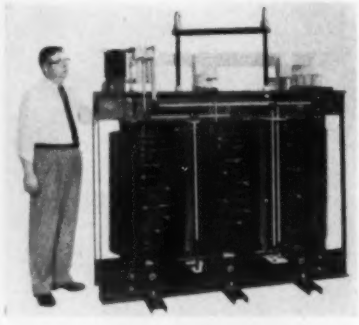
Since 1906
Sales and Service Offices in Principal Cities from Coast to Coast

Manufacturers of Sure-Clad ® Industrial-Batteries • PLASTICELL and PLASTICAL ® Batteries for Communications, Control and Auxiliary Power • Producers of Autolley • Silicon Chargers

CT Test Equipment . . .

(*Continued from page* 102)

tains heavy-duty current-loading transformer, high accuracy multi-range CT standard, variable-transformer current control, switches, and overload protection, all housed in compact console cabinet.
Knopp Inc, 1307 66th St, Oakland 8, Cal.



Dry-Type Transformer . . .

. . . rated 750 kva has more than normal amount of core stock to provide additional overload safety factor. This three-phase unit has 12-kv high side and a low voltage network of 480-Y/277 v. Weight is 7970 lb.
Land-Air, Inc, 7444 W. Wilson Ave, Chicago 31, Ill.

Cable Trough . . .

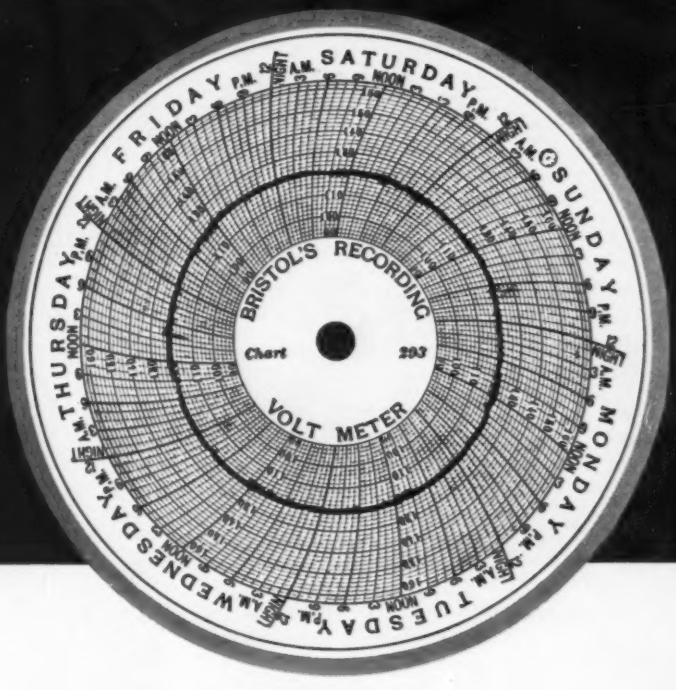
. . . has built-in adjustable straight drop-out to eliminate field cutting and assembly. Opening can be adjusted up to 6 in. in one size and up to 11 in. in a second size. Cable may be inserted from either side of run. Fittings with drop-out running diagonally to center or end of run are also available.
P-W Industries, Inc, Duncan & Melrose St, Philadelphia 24, Pa.

Dielectric Heating Units . . .

. . . in ratings from 7.5 to 100 kw have improved circuits and reduce heating time for non-metallic materials from hours to minutes. They are available for either batch or conveyor type operation. One generator can be used to obtain uniform heating of sections of varying thicknesses.
Induction Heating Corp, 181 Wythe Ave, Brooklyn 11, N. Y.

ALLIS-CHALMERS . . . 25 years of leadership in 5/8% regulators

2 Volts = $1920* per year



Here's how revenue loss is cut by holding a 2-Volt Band

MANY feeders are averaging high voltages during low load periods with low voltages during high load periods. The average may look good on paper. *But the result is a net loss of revenue!*

Regulating within a narrow 2-volt band width increases effective voltage, especially during the time of greatest load without changing the *average* voltage.

Each 1-volt increase in effective voltage increases revenue $960 on average feeder. Allis-Chalmers 5/8% step regulators hold a narrow band width of ±3/4 volt.

For the complete story, call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

*** Based on following factors:**

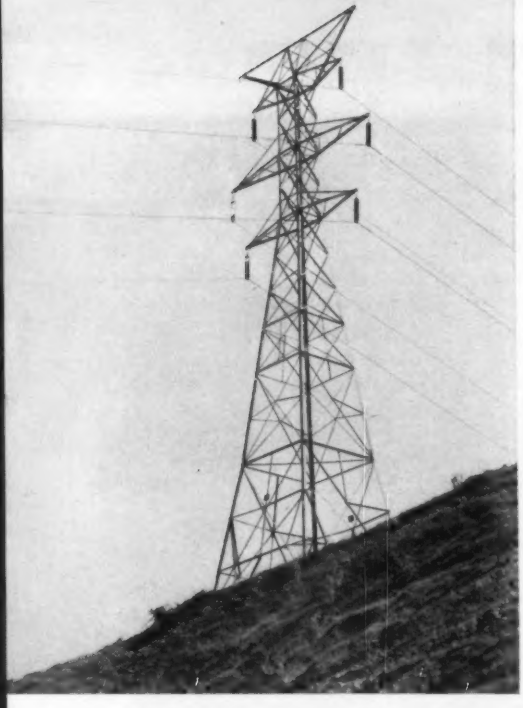
Peak demand — 2000 kw . . . Average demand — 800 kw . . . Annual load factor — 40% . . . Percent lighting and manually controlled heating — 30% . . . Value of kwhr — 3.4¢ . . . Power consumption varies as 1.6 power of applied voltage.

Originators of 5/8% Step Regulators

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-5727



Towers 2050′ apart

Specially designed towers solve tough location problems for Public Service Co. of Indiana, Inc. —a customer of American Bridge since 1940

Transmission towers on the hills near the New Albany generating plant.

support 4 tons of conductor!

To support 132 kv double-circuit transmission lines from its new power station at New Albany across 23.71 miles of countryside, the Public Service Company of Indiana, Inc. used 121 towers designed and fabricated by American Bridge. None of these towers are less than 100′; some are 110′ and 120′ tall.

In skirting the town of New Albany, it was necessary to go through a particularly rough and hilly section with elevation changes as great as 400′ and with distances between peaks ranging from 400′ to 2050′.

Since the line consisted of six high-voltage conductor wires, weighing an estimated 20,802 pounds per mile, those towers which were 2050′ apart had to be strong enough to safely support 4 tons. *And, when loaded with ice, the weight could be twice as heavy.*

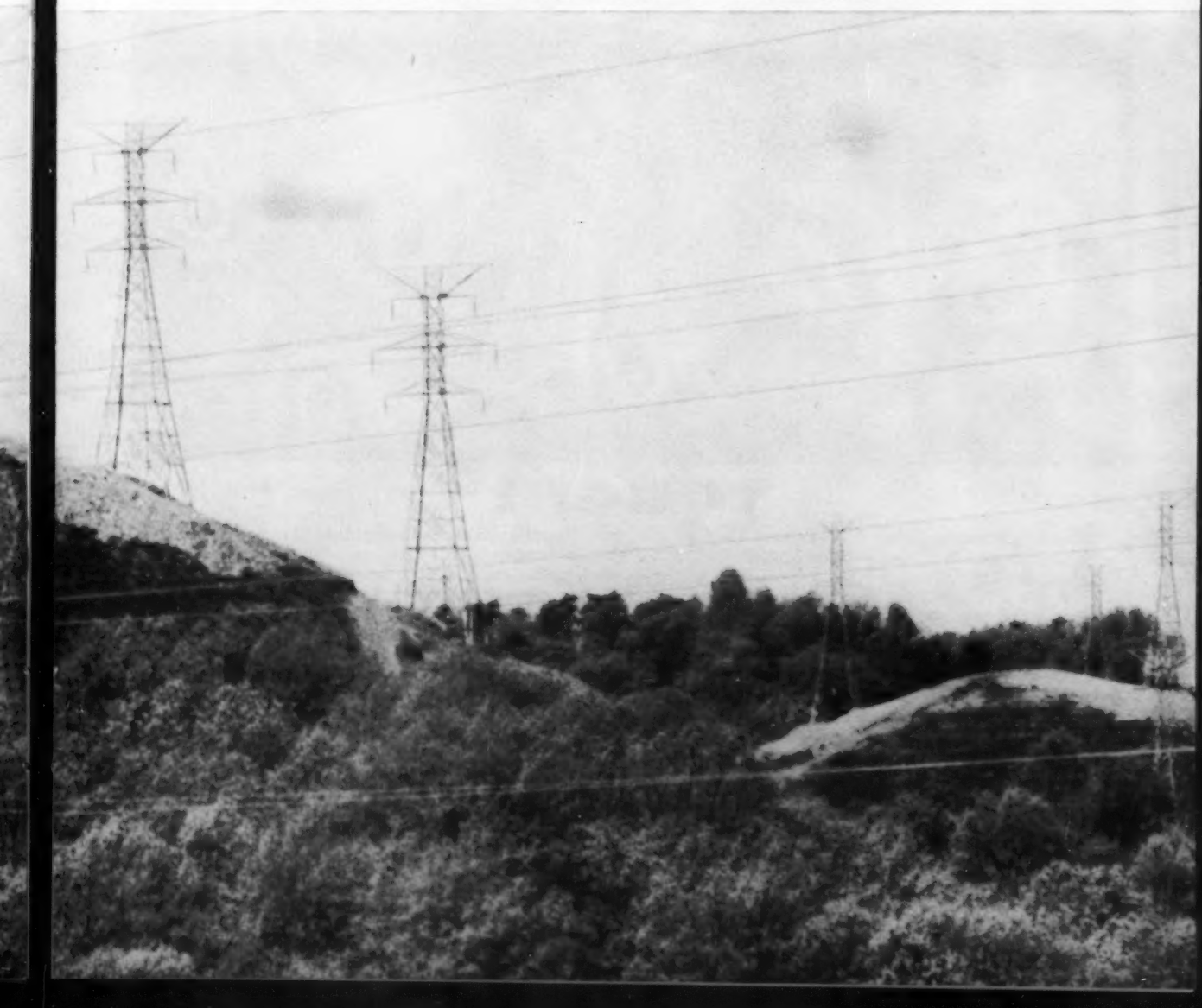
The Public Service Company of Indiana, Inc. has been a tower customer of American Bridge since 1940. This latest order is in recognition of the fine service received from the product itself, and the good relations which have existed between the companies.

For recommendations based on your specific requirements, just write our nearest office.

USS is a registered trademark

American Bridge Division of USS United States Steel

General Offices: 525 William Penn Place, Pittsburgh, Pennsylvania. Contracting Offices in: Ambridge • Atlanta • Baltimore • Birmingham • Boston • Chicago • Cincinnati Cleveland • Dallas • Denver • Detroit • Elmira • Gary • Houston • Los Angeles • Memphis • Minneapolis • New York • Orange, Texas • Philadelphia • Pittsburgh Portland, Ore. • Roanoke • St. Louis • San Francisco • Trenton • United States Steel Export Company, New York



TOUGH!

Husky Herman is getting nowhere fast. He ought to know it takes a lot of doing to damage one of VICTOR'S Apparatus Insulators!

Here's why: They are designed to withstand steep front wave impulse in addition to the normal 1.5 x 40 standard impulse. They are manufactured and tested with the industry's most modern equipment. They're made of Purified Porcelain—toughest, most durable porcelain ever made. Scientifically fitted glaze, properly and uniformly applied, gives maximum strength and protection against contamination. Precision manufacture and accurate alignment of shells, cap and pin in tempered, cast-iron jigs produce an accuracy that makes stacking fast and easy. Joining of component parts with premium grade insulator cement gives maximum tension, torsional and cantilever strength. Vigorous high frequency and 60-cycle flashover tests follow routine mechanical tests on every unit.

VICTOR No. 729 Apparatus Insulators are tough, dimensionally accurate, give exceptional service. Insist on highest quality. Insist on VICTOR.

I-T-E CIRCUIT BREAKER COMPANY, INC.
VICTOR INSULATORS DIVISION
Victor, New York

Report on
Electrical Business Outlook

I. The Recession is Over

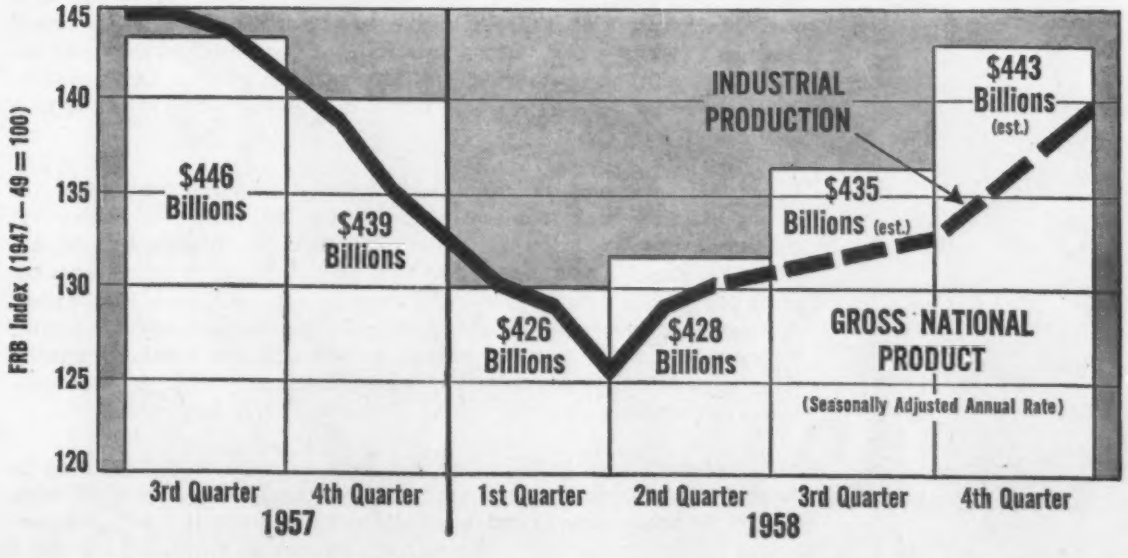
Events in Iraq and Lebanon have pushed economic news right off the front page. But they haven't covered up the fact that recovery from the recession is already starting to pick up momentum. Business should show a marked rebound as we move into the tail end of '58—particularly in appliance and energy sales.

Key economic fact about the Middle East crisis is not that it will add any huge new demand for goods and services—either on the military side or in consumer "scare buying" of the Korean type. The crisis merely reinforces trends that were well underway. Business will now move a little quicker to build up depleted inventories. And the Defense Department will make sure that its sharply rising new orders stay on schedule. But both these factors had already promised to give a substantial boost to production in late 1958.

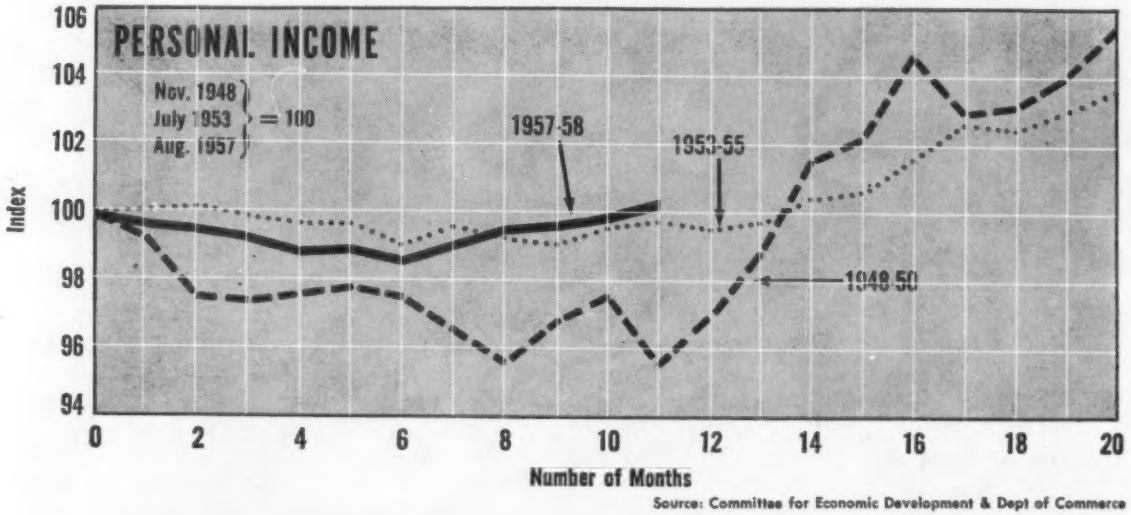
Most of the economic indicators already point to recovery. Gross national product turned the corner some months ago, and with a little luck can wipe out the recession deficit by early 1959 (see chart). Industrial production will take a little longer to reach a new peak. The FRB index will do well to break 104 by year-end, still some 7 points shy of pre-recession levels. But that's still a good, solid recovery. And it's enough to put life back into the demand for industrial power—which has been the weak sister in '58 energy sales.

Recent gains in production run pretty much across the board—all the way from metals to textiles. Of the 24 industries in the FRB index, 20 were moving up at mid-year. And you can see by the recent price hikes that steel and nonferrous metals are both banking on a sharper pick-up after the summer.

Appliances should also see a much better second half, thanks mainly to the smart pace of new housing starts and personal income. Sales have perked



Personal income has held up remarkably well in this recession . . .



Source: Committee for Economic Development & Dept of Commerce

up substantially in some parts of the country already, and the National Electrical Manufacturers Association's Index shot up 21 points in June. The fall push should put a long awaited end to the two-year appliance recession. Air conditioners and freezers are leading the upswing. But, according to one large electrical company, the TV replacement market is the sleeper to watch during the next year or so.

II. Consumer Income Surges Strongly

Personal income stands out as easily the brightest spot in '58 recession. By most other yardsticks—such as GNP, production, unemployment—the current slide was sharper than the 1953-54 or 1948-49 recessions. But consumer income has fared better this time. And it has done so without a tax cut.

Income has been rising strongly since last spring. And the low point in April wasn't very low, mainly because of higher unemployment benefits, social security and substantial wage hikes during the recession. A banner farm year, healthy dividends and government salary increases have also bolstered incomes. At mid-year the annual rate was back up to $352 billion and this month will set a new post-war high. The important point is that consumers have recouped their losses from the recession in less than a year—faster than in '49 or '54 (see chart).

Up to now, the strength in income hasn't helped durable sales very much. In fact, there's been a tight squeeze on the market for hard goods because (1) consumers are saving more, (2) they're cutting back on installment credit, and (3) rising prices for food, rent and services have siphoned off money from the more postponable durable goods. Whereas income went down by less than 2% in the recession, what the economists call "discretionary income" slumped by more than 8%. But the outlook for the next six months is steadily rising income, a drop in food prices, more discretionary cash for consumers, and more new credit—a much stronger market for the big ticket items.

And consumers seem to be getting over their recession jitters, according to the latest Michigan survey of buying intentions. Despite unemployment, some 41% of the families interviewed thought "it was a good time to buy large house-

hold items." This is a higher percentage than in last fall's survey, and it's growing steadily as jobs and overtime become more plentiful.

Of course, prospects don't add up to a consumer buying spree a la 1955. Business just doesn't have the "easy sell" which comes from big backlogs of consumer demand, a fantastic growth in credit and a boom in family formation. But sustained consumer spending did keep the recession to mild proportions, and it will be the major force in the coming upturn. The route to expanding sales lies in new products, many of which will be tested in 1959.

III. Corporate Profits Look Sick

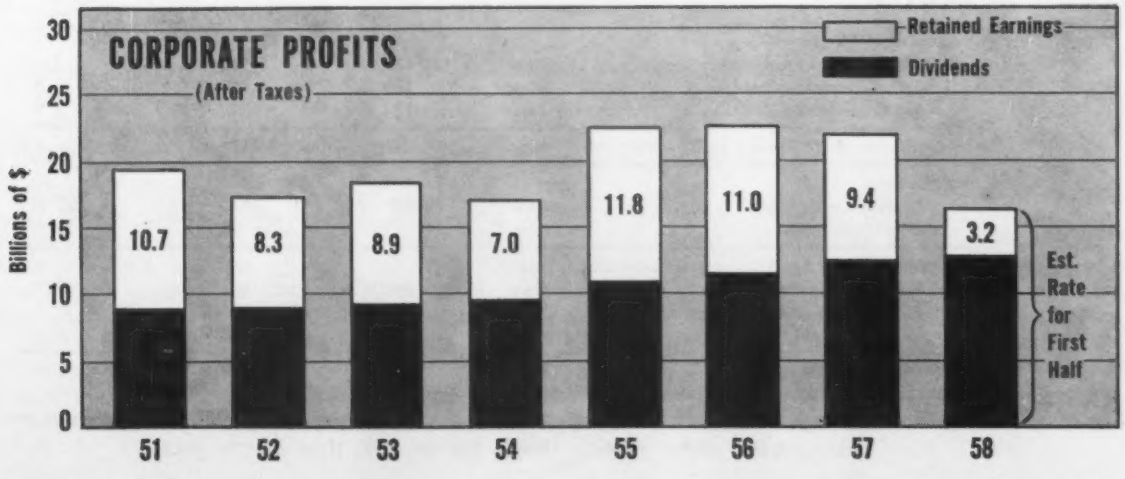
If personal income has fared well, profits have really taken a beating during the '58 recession. First quarter profits after taxes plummeted to an annual rate of $15.5 billion. And, less dividends, there was only $3.1 billion left in retained earnings. (down from $10.6 billion a year ago). You have to go back to 1940 to find retained profits at such a paltry level.

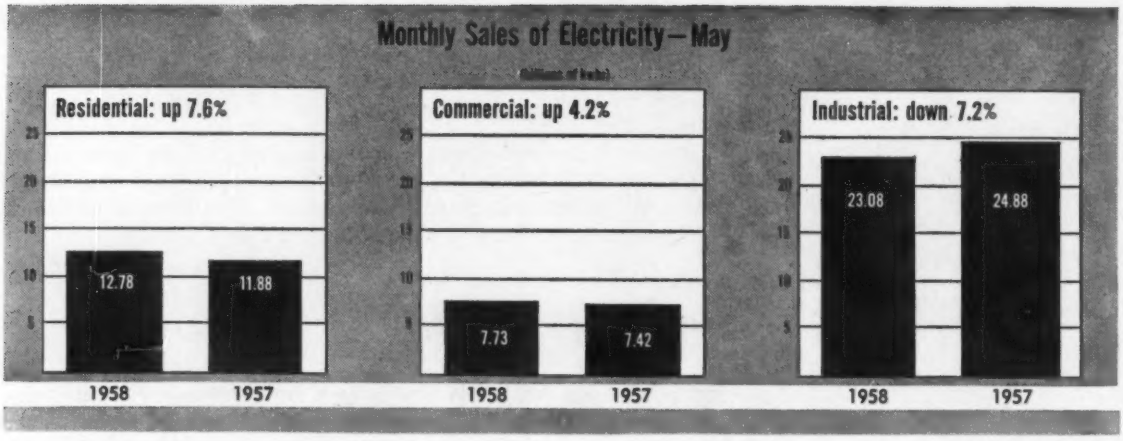
Second quarter earnings didn't show much of an improvement—although the drastic slide did come to an end. According to the Wall Street Journal's quarterly check on 552 leading corporations, earnings were off 32% from a year ago. The first quarter drop was 35%, the worst in post-war history.

Utilities were one of the few to turn in a plus figure for the second quarter, up about 1% for the 18 companies reporting. Other gainers over '57 were food, drugs, tobacco, distillers, office and farm machinery. But the sick list included such stalwarts as autos (off 61%), steel (off 44%), oil (off 38%) and chemicals (off 23%). Compared to most manufacturers, electrical companies did well to come away with a 13% drop in earnings.

How fast profits can recover as we move out of the recession is the big question. Some improvement is a sure bet for the next six months. But many companies think that the third quarter performance will be slow and unspectacular. And, as it now stands, earnings are far too low to finance much spending on new plant and equipment. They are also far too low to sustain the inflation-minded stock market at current prices for any length of time. The rebound in profits has to be a big one—if the overall recovery is to stay on a firm footing.

. . . But corporate profits have really taken a beating





Power Statistics . . .

		Latest Month	Year Ago	Annual Change %
Capacity	May	132.92	122.79	8.2
Peak—Class I Systems, million kw	Dec.	107.1	102.4	4.6
Estimated Dec. '58 Peak	May	118.0	122.7	− 3.8
Production—billion kwhr	May	51.18	51.70	− 1.0
Hydro		13.61	11.80	15.3
Fuel		38.57	39.90	− 3.3
Sales—billion kwhr	May	46.04	46.65	− 1.3
Residential		12.78	11.88	7.6
Commercial		7.73	7.42	4.2
Industrial		23.08	24.88	− 7.2
Other		2.45	2.48	− 1.2
Fuel Consumption	May			
Coal—million tons		11.24	12.60	−10.8
Oil—million barrels		4.78	6.31	−24.2
Gas—billion cu ft		117.36	108.66	8.0
Net Income Class A & B Co's—$ million	May	109.14	102.62	6.4
Residential Customers—millions	12 mos.	46.99	46.06	2.0
Revenue per kwhr	ended	2.54¢	2.58¢	− 1.6
Avg kwhr per customer	April 30	3,264	3,034	7.6
Avg annual bill		$82.90	$78.28	5.9

Business Statistics . . .

Indexes: 1947–49 = 100				
FRB Industrial Production	June	130	145	−10.3
ENR Construction Cost	August	160.3	154.8	3.6
BLS Cost-of-living	June	123.7	120.2	2.9
New Orders for Machinery (1950 = 100)	June	147	153	− 3.9
NEMA Sales				
Insulation materials	June	107	140	−23.6
Electric appliances	June	105	93	12.9
Wholesale prices				
Motors and generators	May	145.8	141.3	3.2
Transformers and regulators		147.6	147.7	− 0.1
Switchgear and fuses		173.5	165.9	4.6
GNP—annual rate—$ billion	2nd qtr.	428.0	441.2	− 3.0

Significant changes: NEMA's major appliance index jumped up a full 21 points from May to June, placing sales above year-ago levels for the first time in two years.

EXAMINING MEDALLION in front of model home are, l to r, Builder Borovica, W. Desmond, and L. E. Pierron, CE vp

BASEBOARD ELECTRIC HEATING is explained to L. E. Pierron, Commonwealth Ed vp by Hotpoint's E. J. Sorenson

Builder Sees Gold in Medallion Homes

He will put up 250 in Chicago suburb. Purchase price put at $15,400, and total monthly electric bill seen at $38.80

An Illinois builder is planning to put up 250 all-electric Gold Medallion Homes in a Chicago suburb in anticipation of approval of Commonwealth Edison's proposed 1.75¢ electric heating rate by Illinois Commerce Commission.

The two big features of Ray Borovica's Skyline Estates 250-home development in Valley View, Ill., center around dollars and cents:

• **Purchase price** of an all-electric home will be only $15,400. It will contain Hotpoint's new baseboard electric heating units with individual room thermostats, an electric range, automatic clothes washer, dryer, refrigerator, garbage disposer, and electric lawn mower.

• **Operating cost** for electric usage is estimated at $38.80 a month. Kwhr use is pegged at about 24,400 a year.

The homes will have three bedrooms, a living room, and a combination kitchen-dining room. Mineral wool insulation is used throughout walls, ceiling and floor.

Borovica points out that the same all-electric features which make the home easy to sell also enable him to build and sell it for its low price. These are elimination of chimney, furnace, boiler, radiators, flues, fuel tanks, and the spaces necessary to contain them. The electric heating is cleaner, more comfortable, convenient, healthier, safer, more flexible and practical.

Distribution at Skyline Estates will be with buried cable and semi-buried transformer vaults. Borovica says this is costing him no more than overhead facilities because Commonwealth Ed is making allowances on underground distribution costs in view of the all-electric equipment installed in the homes. He is doing the trenching for the cable and excavating for the vaults which, he says, does not compare with the cost of installing gas.

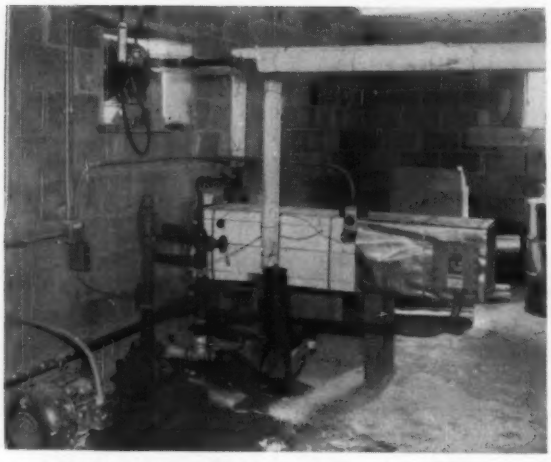
Inland Empire Electrical League Spurs Heating Campaign

An electric heating sales promotion campaign using all major media has been launched by the Inland Empire Electrical League, in the Pacific Northwest.

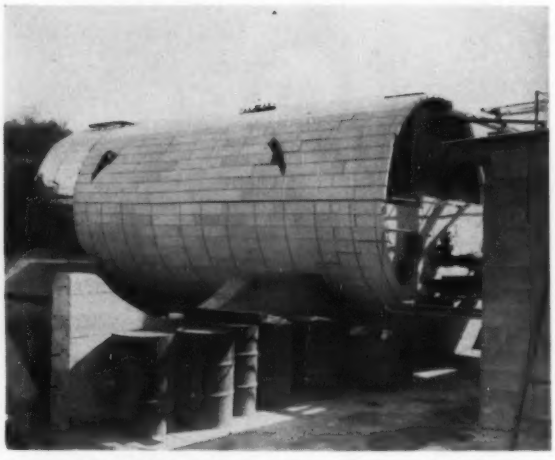
The League estimates there is a July-to-January sales potential in its area of $962,000 in residential and commercial electric heating installations.

Advertising objectives are: (1) To establish the fact that electric heating has a large public acceptance; (2) to publicize the electric heat application to commercial and public buildings; (3) to show adaptability of electric heating in new and existing homes; (4) to establish desirable features of electric heating for residential dwellings with emphasis on product economies; (5) to give all league member contractors advertising support in all media to lend a strong assist to contractor advertising; (6) to create a record sale of residential and commercial installations for the last six months of 1958.

(*More Selling on p* 114)



HEAT TRANSFER UNIT has 30 kw of heaters to keep circulating oil for pug mill and weigh bucket at 270 to 300 F



INSULATED 10,000-GAL asphalt storage tank has five heaters totalling 38 kw. Heat loss is only 10 to 15 deg per day

Asphalt Plant Finds Electric Heat Economical

JAY ALDRIDGE, Industrial Sales Engineer, Duquesne Light Co, Pittsburgh, Pa.

A decision to use electric heat for a new asphalt plant instead of an oil-fired highway burner is reaping big benefits for the Rochester Coal, Trucking, and Contracting Co., Rochester, Pa. Over-all operating costs are 34% less. Control of the heat is more precise and more flexible. The lower maintenance requirements of the electric system, compared to the highway burner, mean savings in labor and material costs. Safety conditions are improved, without the ever present danger of fire which any fossil fuel involves. Moreover, the operating efficiency is higher, labor costs are lower, and the plant power factor is better than 95%. Although the company had to return the unused highway burner, at a substantial loss, the operating and economic benefits of electric power more than justify this expense.

The amount of piping required in the plant has been greatly reduced. Individual control of heat to the various units is now possible. Had the highway burner been used, the entire plant would have had to be shut down, with large losses in heat and production, whenever the burner required maintenance. Moreover, the entire unit would have to be fired up even if heat was only required in one unit. In addition, the initial heat-up time on cool mornings would be much greater.

With a rated capacity of two tons per minute, the plant now has a connected motor load of 385 hp, plus 131 kw of electric resistance heaters. Average monthly demand is approximately 240 kva, with a 51,000 kwhr consumption, of which 36,000 is used for heating. Pleased with the success of this operation, the company now plans to install another storage tank to increase standby capacity.

Tanks Heated at Night

The two 10,000 gal asphalt storage tanks are kept at a temperature of at least 325F by using five 38-kw immersion heaters in each tank. These thermistatically controlled, two-stage, 20-ft heaters are inserted into the bottom of the tanks through a cutout without interferring with the existing coils.

Pipe lines used to transfer the hot asphalt from the storage tanks to the pug mill were originally intended to be heated by a hot oil jacket. In converting these to electric heat, tracers were placed in the center of the pipe line. With accurately controlled temperature, heat can be applied gradually to prevent coking and general breakdown of the asphalt. A total of 10 kw rated at 5 w per in. were used.

A 30-kw multipass electric heater was employed to heat the circulating oil for the pug mill, weigh bucket and asphalt pump. By heating only these equipments with hot oil and heating the storage tanks and pipe tracers individually, the amount of piping for the hot oil system was reduced by 90%. The multipass heater uses only 100 gal of this special oil— selling at about 75 cents per gal—compared to 1,200 for the highway burner. Make-up losses due to leakage or normal use is only 1%, producing an additional saving.

Although direct electric heating for the dryer could not be justified economically, the company was able to use a cheaper, more viscous oil to fire it by insulating the oil storage tank and installing 15-kw of electric immersion heaters in it. Cost of this oil is nine cents per gal, against 14 cents for the regular oil.

Since the material in the insulated tanks loses only 10 to 15 deg per day, the tanks can be heated at night. Because the daytime demand for motor load and the pug mill heaters exceeds the night heating demand, the additional cost of heating the storage tanks is made up almost entirely of energy charge of kilowatt-hour consumption.

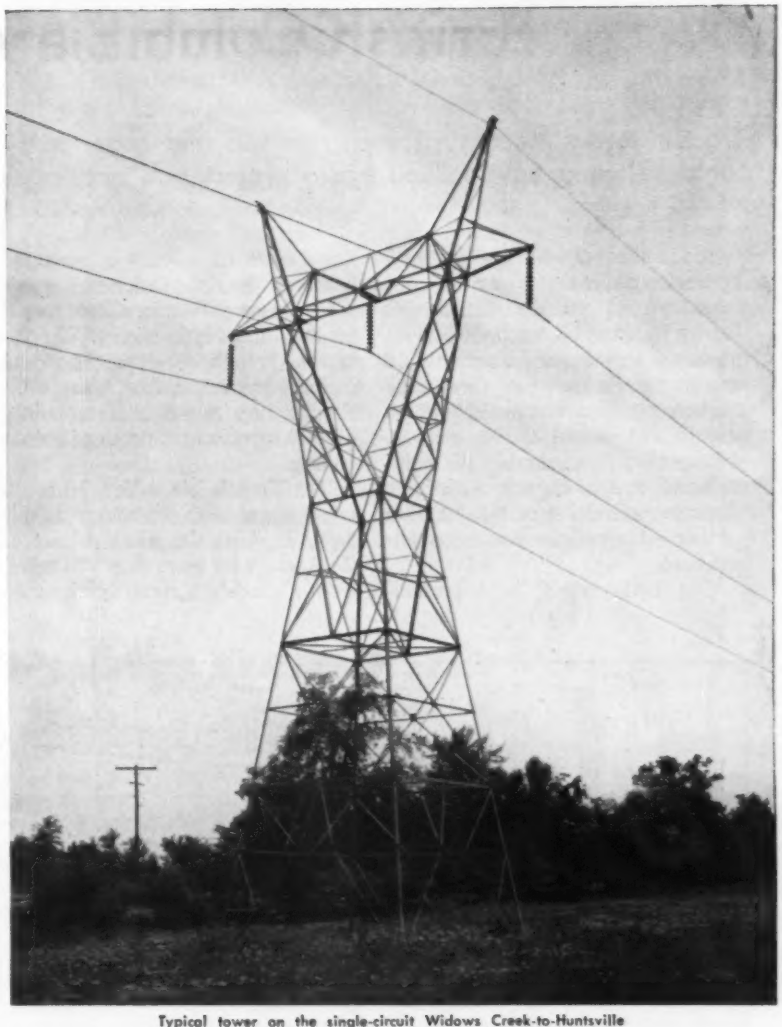
New 161-kv TVA Line to Alabama Missile Center

Single-circuit steel towers carry steam-generated electric power from Widows Creek to Huntsville

Back in 1950, Huntsville, Ala., was a typical southern town of 38,000 or so. Today it's a different story. With a metropolitan area population of about 63,000 and growing fast, it is known far and wide as one of the world's foremost centers of ballistic missile technology. At the Army's nearby Redstone Arsenal and the Ballistic Missile Agency work proceeds on operative missiles such as the Redstone and Jupiter—as well as the even more amazing missiles of tomorrow.

AUGMENTS HYDRO POWER . . . Formerly only two 161-kv lines, from the Wilson Dam and Guntersville Dam hydro plants, served the area. But with population and industry booming, another source was needed. This was provided when the TVA placed their Widows Creek-to-Huntsville line into service in February, 1958. The Widows Creek steam plant, one of TVA's largest, has six 125,000-kw units in operation, and a giant 500,000-kw unit under construction.

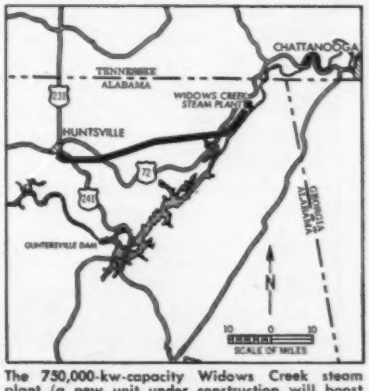
215 TOWERS . . . The new line required 51 miles of single-circuit steel towers, supplied by Bethlehem Steel. Average tower height is 91 ft and average span length is 1235 ft. Conductors are 795,000 cm, 26/7 stranding, ACSR, with max design tension of 9000 lb under loading of 1/4-in. ice and 8 lb wind at 15 deg F. Overhead wires are 7/16-in. high-strength steel with maximum design tension of 4500 lb.



Typical tower on the single-circuit Widows Creek-to-Huntsville 161-kv line. The galvanized steel towers average 91 ft in height.

FABRICATED AT LEETSDALE . . . The towers were designed by Bethlehem, and detailed, fabricated, and galvanized at our tower shop in Leetsdale, Pa., near Pittsburgh. West Coast requirements are handled at Bethlehem Pacific tower shops at South San Francisco, Calif., and Seattle, Wash.

These three large shops are fully equipped to furnish your requirements for transmission towers, poles, and substation structures. May we quote your next project? Just write or call the Bethlehem sales office nearest you.



The 750,000-kw-capacity Widows Creek steam plant (a new unit under construction will boost capacity to 1,250,000 kw) is in the extreme northeast corner of the state. The line to Huntsville extends south and west for a total of about 54 miles.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

British Columbia Area Promises

Tract in Rocky Mountain Trench reserved and under study for developing $600-million hydro project and ancillaries

More than 3,000 Mw of new hydroelectric capacity may be obtained from British Columbia's Rocky Mountain Trench, 500 miles north of Vancouver, if active field and design investigations continue to show promise. The project, which could cost about $600 million, would more than double BC's developed hydro capacity. Specific plans for utilization or transmission of the energy have not been announced.

The hydro study is a preliminary facet of a master plan for northern British Columbia, projected by Axel Wenner-Gren, Swedish millionaire industrialist. The $1-billion Trench development would include mineral, timber, transportation, and hydro power features in a 40,000 sq mile area north of Prince George.

The Trench is a valley, 10 to 20 miles wide, near the center of this area. It skirts the western base of the Rockies for more than 800 miles, from Canada's Yukon Territory to Idaho. Within it flow eight major streams which rise in the Providence. These include the Fraser, Columbia, and Kootenay Rivers. One length of the Trench has a temperature range from —68F to 90F and often snow is 70 in. deep. There the Finlay River flows south to meet the north-flowing Parsnip. The resulting stream, known as the Peace, runs east, traverses the Rockies through a 2,000-ft pass, and winds through the plateau of northeast British Columbia and northern Alberta, which is rich in oil and gas.

Engineers surmise that they've found several excellent sites for dams up to 600 ft high in the 75-mile reach of the Peace. One dam, according to a Wenner-Gren associate, could form the world's largest man-made lake, stretching some 300 miles along the Trench. Diamond-drilling crews are finishing preliminary foundation investigations, and a detailed, although preliminary, report on civil structure feasibility is due soon.

RESERVED AREA (upper shading) is some 500 miles north of Vancouver where Peace River development progresses. BC Electric's area is the striped patch

Designated 'Reserve'

All preliminary Trench development is directed by Wenner-Gren Foundation under formal agreement with the province of British Columbia. The foundation formed and staffed the Wenner-Gren BC Development Co, Ltd., after 2½ years of negotiation with the Province. An agreement, signed November 1956, grants the company rights to investigate mineral, timber, and hydro potential in an area about 10% the size of the Province. The Province placed a "reserve" on the land and timber to exclude "nuisance" claims and promised the foundation "first refusal" on certain land and timber rights upon application plus satisfactory plans.

By designating about 15% of the area "mineral reserve" prospecting was blocked in places subject to flooding by hydro developments. It is apparent that the Province intends to open the area rapidly by determining and locating its resources.

The Development Co promised to start construction by April 1960

3,000 Mw

of a railway, possibly a 180-mph monorail, from McLeod Lake 400 miles to the Yukon, through the Trench. By then, the provincially operated Pacific Great Eastern Railway will pass McLeod Lake with its line from Dawson Creek to Vancouver. Wenner-Gren put up a $500,000 good-faith bond on the railway issue.

During 1957, Wenner-Gren BC Development signed $3 million in contracts for hydro, mineral, railway, pulp, paper, and timber surveys. The hydro contract, assigning full survey responsibilities to British Thomson-Houston Co, was enacted last October. Completion data for the final report to the Province are set for the end of 1959. BTH's project engineer is R. L. Cantrill of London, and Sir Thomas Foy, consulting engineer knighted for leadership of Pakistan irrigation and power projects, has been retained to direct BTH field activities.

This year, as soon as weather permitted, Foy started diamond-drilling crews working the Peace between the Finlay-Parsnip confluence and the Alberta border. Foy retained Sir William Halcrow & Partners, Ltd., and BC Engineering Co, Ltd., for independent damsite feasibility studies. BC Engineering, under President Tom Ingledow, is responsible for engineering work of British Columbia Electric Co, Ltd, the Privince's largest private utility.

Wenner-Gren's mineral-survey contractors have been checking the entire reserve from the air by magnetometer, gravity, electro-magnetic, and radioactivity detectors, and timber-product and railway surveys are in progress. In late July, Wenner-Gren stated that engineering studies have yielded "even more than we expected." Project financing, he said, presented no problems, as "so many people from Europe and other parts of the world want to invest in it."

There were two earlier schemes for developing BC's hydro resources. One that went ahead was the 400-Mw Kemano Project of Aluminum Co of Canada, supplying the Kitimat smelter. Another, in an off-and-on condition for some years, is the $800-million, 3,000-Mw Frobisher scheme for harnessing the Taku. The Province, it is variously estimated, has about 23-million hp of hydro potential, about 10% developed. Of the remainder, 7 to 11 million is tied up in the Fraser, Thompson, and upper reaches of the Columbia Rivers.

Provincial power demand is doubling each five to eight years. To meet its requirements, BC Electric Co has put in service or has building almost 1,000 Mw of hydro and has begun construction of its ultimately 900-Mw Burrard gas-fired steam plant near Vancouver. Mining (including Alcan) and timber interests and small utilities have developed about 1,000 Mw of hydro. British Columbia Power Commission, the public power authority, has almost 300 Mw. Only about 200 Mw of thermal and engine capacity is operating in the Province.

With good rail transportation through the Trench, it is likely that smelting, timber, wood products, and ancillary services would absorb locally a substantial part of the Peace River power. For overall project feasibility, most of it must be transmitted, probably to the major load centers in the Vancouver area, about 500 miles south.

Although many engineers do not consider the Peace River within economical transmission distance of Vancouver, Swedish engineering thinking may play a part. In Sweden heavy blocks are transmitted even longer distances, through successful use of 400-kv transmission.

Public Relations (*Continued from page* 62)

state and local government action on taxes, utility regulation; and economic, financial, industrial, labor, civic, political, and scientific affairs of interest to CEI executives.

Attractive Miss Virginia Chester, CEI's news analyst for 14 years, selects and condenses items for the summary. She reads 29 editions of daily newspapers, 34 weeklies, 11 weekly magazines and eight monthly magazines. The newspapers include all the papers published in CEI's area, seven papers from other Ohio sections, five from New York, two from Chicago, and one from Boston.

General acceptance of the service can be judged by its circulation growth from 14 executives in 1944 to more than 200 today. Messengers deliver each edition to top officers; the mailing department handles the others.

Another early service, the Daily Summary of News, is distributed every business day to about 500 key Consolidated Edison Co employees. It includes press and air reports digested by the public information bureau.

On a typical day the summary might carry such items as a company spokesman's quotes about an outage, a proposal in Congress for a federal power dam, a significant labor settlement in a related industry, the price paid by another utility for a new bond issue, announcement of a midtown skyscraper, or trade journal reports.

The summary is a by-product of the bureau's traditional operations since its source material is gleaned chiefly from publications subscribed to for top management's information or for the library.

These publications include metropolitan New York daily and weekly newspapers, plus business and trade journals. In addition, grist comes from a radio-TV monitor service and out-of-town or overseas notices picked up by clipping services.

While the summary is designed to reflect what is printed or said outside the company, exceptions are made for spot intramural news such as executive appointments and dividend announcements.

All members of the public information staff share the job of scanning incoming publications, clippings and air reports for subjects of general interest or of concern to specific departments. Each morning a member of the staff dictates the summary, editing as he goes. Most copies reach the reader's job location by the time he has returned from lunch.

(*Continued on page* 126)

Two Utilities Name Chief Electrical Engineers

B. Van NESS J. W. GRAFF

Bartow Van Ness, Jr, has been named chief electrical engineer, Pennsylvania Power & Light Co, and J. W. Graff has been promoted to chief electrical engineer, Alabama Power Co.

Van Ness attended John Hopkins University and MIT, from which he graduated in 1922 with a masters degree in electrical engineering.

He began his utility career in 1922 with Pennsylvania Water & Power Co, and worked for that company until it merged with PP&L in 1955.

He is a Fellow in AIEE, and a member of EEI.

Graff, a University of Florida graduate, began working for Alabama Power Co in 1927.

He was previously senior engineer in charge of the utility's system planning group.

Minneapolis-Honeywell Elects Two Vp's

George W. Muschamp has been elected vice president-engineering, and O. B. Wilson has been elected vice president-marketing, for the Industrial Products Group, Minneapolis-Honeywell Regulator Co.

Muschamp joined the Brown Instrument Division in 1930, and was formerly manager of engineering.

Wilson joined Brown Instrument in 1923, and previously served as the division's general sales manager.

In other promotions, R. L. Mallory was made sales manager, Industrial Products Group; John A. Robinson was promoted to sales manager and John M. Wilson to director of engineering, Brown Instruments Division; Howard J. MacDonald was appointed general manager, Valve Division; and H. Earl Benson became sales manager, Rubicon Division.

MUSCHAMP WILSON

Three Manufacturers Appoint Sales Managers

FISHER CARUTHERS GRESSENS

Recently appointed sales manager for their respective companies were Fremont Fisher, Electrical Products Group, Electric Auto-Lite Co; John E. Caruthers, Central Transformer Corp; and Herbert L. Gressens, Electric Utility Division, Whirlpool Corp.

Fisher was previously vp and director of sales, Fort Worth Steel & Manufacturing Co.

Caruthers, who joined Central in 1955, assumes duties previously shouldered by vp Ralph Mitchell, Jr.

Gressens, in his new position, will handle Whirlpool's electric utility sales assistance program.

L. O. Steger Advances

Lyall O. Steger has been promoted to superintendent of the meter department, Potomac Electric Power Co.

Steger, a 31-year veteran with the company, has served as assistant superintendent of the meter department since 1951.

He is a member of the American Institute of Electrical Engineers and the meter and service committee of Association of Edison Illuminating Companies and Edison Electric Institute.

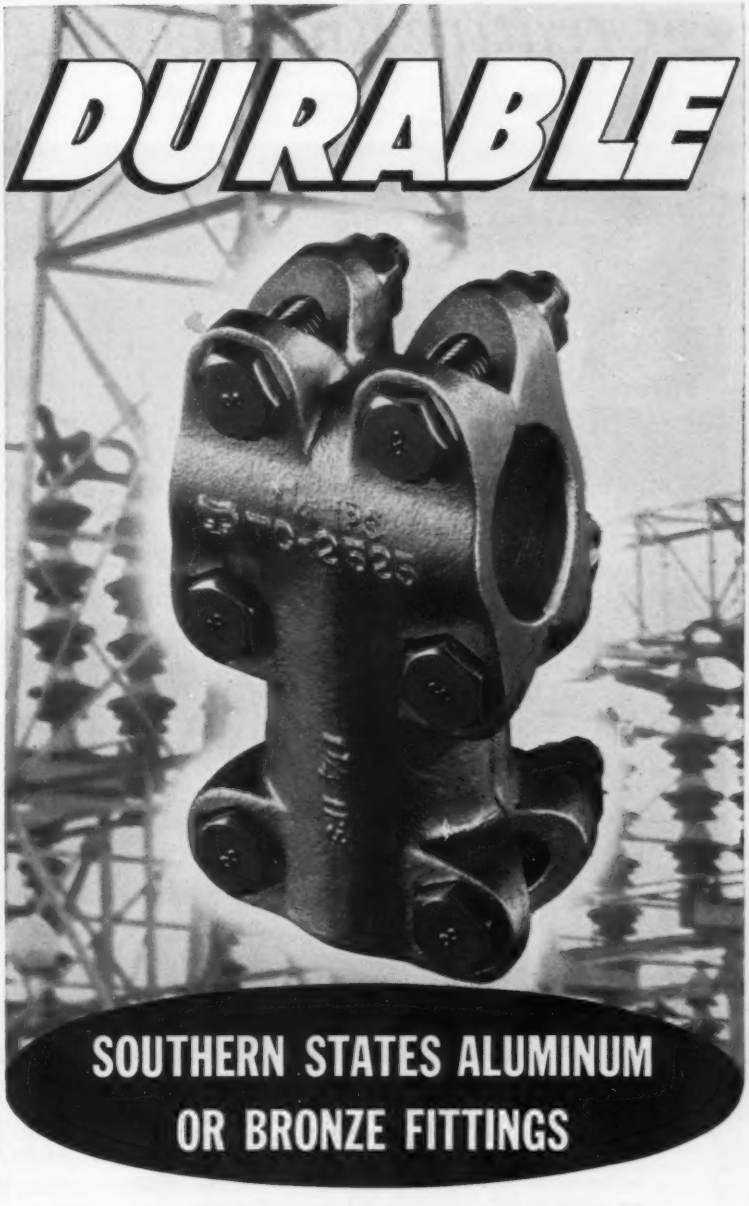
In another promotion, Horace E. Bradley was made assistant superintendent, meter department. He has been with PEPCo for 41 years, and was formerly general foreman in charge of the meter department's laboratory and shops.

PERSONAL BRIEFS

Albert K. Amazeen has been promoted to superintendent of Connecticut Light & Power Co's Housatonic hydroelectric division. The utility's new test engineer is **R. Arnold Davidson,** succeeding **John M. Joy,** retired.

New president of the California Public Utilities Commission is **C. Lyn Fox,** political editor of the **San Francisco Cal-Bulletin.**

Herbert A. Blair has been elected comptroller and secretary of Central Ilinois Light Co.



Knowing that fittings are often re-used, Southern States has designed its entire line with easy, on-the-job assembly and re-assembly foremost in mind. Southern States connectors and bus supports have recessed hexagonal bolts, assuring easy and rapid "one-wrench" installation or removal. Each connector fits properly, has ample strength, and is sufficiently rugged at stress points. *Never underestimate the importance of a good connection!*

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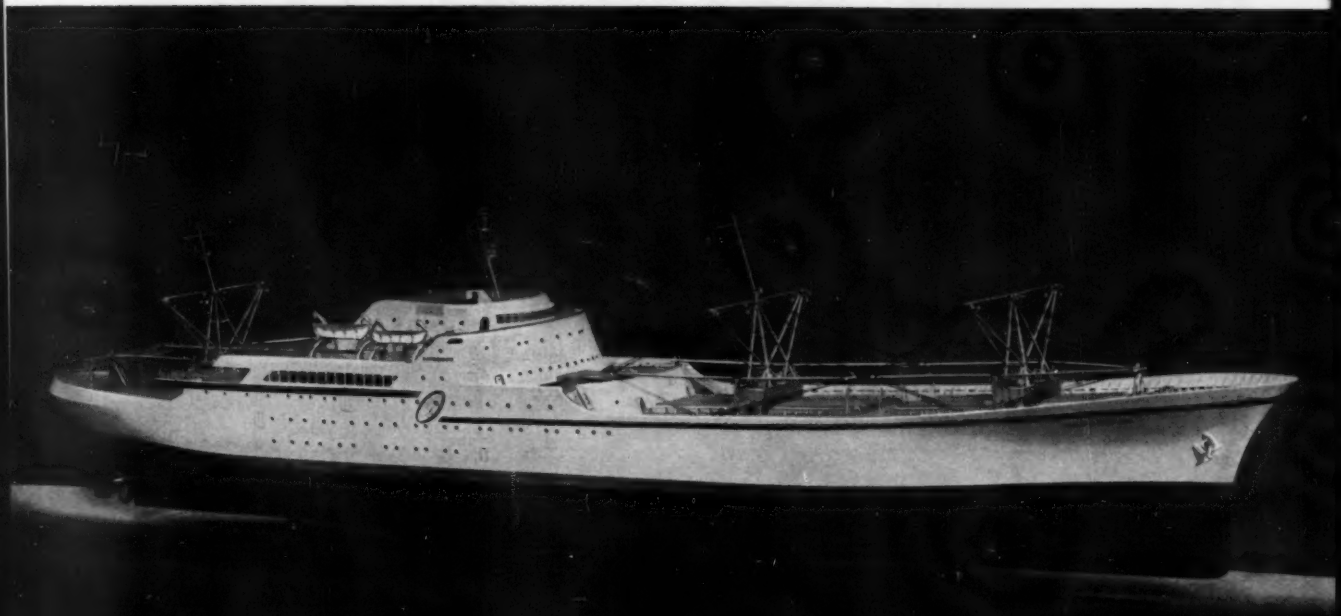

One of the U.S. Government's exhibits at the Brussels World's Fair is the model of the first nuclear ship, the N/S SAVANNAH, shown above.

The De Laval Steam Turbine Company is proud to play an important part in the design and construction of this 22,000 shaft horsepower vessel, the keel of which was laid on May 22, 1958, Maritime Day, at the New York Shipbuilding Corp. in Camden, New Jersey.

Under the joint sponsorship of the Atomic Energy Commission and the U. S. Maritime Administration, major contributions to the design and construction of the vessel and its machinery are being made by:

- ***George G. Sharp, Inc., naval architects, designers of the vessel***
- ***Babcock & Wilcox Company, designers and builders of the pressurized water reactor and its accessories***
- ***New York Shipbuilding Corp., Camden, N. J., builders of the vessel***
- ***De Laval Steam Turbine Company, designers and builders of the main propulsion machinery, other engine room auxiliaries; coordinators of all engine room equipment.***

We are particularly happy to serve in connection with this project of international importance. De Laval has often performed other important services as complete engineering coordinators, and is fully prepared to undertake similar assignments.

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Dayton Power & Light Co has named **Clement M. Harner** manager of the Xenia, O, District, succeeding the late Leonard V. Nilson. Stepping into Harner's former post as supervisor of the electric department, is **Jack E. Whitney.**

Georgia Power Co has named **W. H. Joiner** manager of industrial relations. **R. O. Conwell** has been elevated to manager of the fuel supply department, and **Hal B. Wansley** has been made assistant to the vice-president, finance.

New director of load and economic research for Hartford Electric Light Co is **Roy C. Fosberg.**

Hawiian Electric Co has a new commercial manager, **Herbert Heinrich.**

James R. Jones has been appointed assistant treasurer of Iowa Southern Utilities Co. The utility's new system distribution engineer is **W. M. Heusinkveld.**

Larry Dwon, manager of engineering manpower for American Electric Power Service Corp, has been elected president of Eta Kappa Nu, national electrical engineering honorary fraternity.

Recently named project manager for Arkansas Power & Light Co's 325,000-kw steam plant to be built at Helena: **William M. Wolford.**

Emil V. Lindseth has been named assistant chief design engineer for the Bureau of Reclamation at Denver, Colo, with design responsibilities for development projects in 17 western states and the state of Alaska.

Vice president of Central Illinois Public Service Co, **J. C. Happenny** has been appointed to the electric utilities committee, U. S. Chamber of Commerce. Also at CIPS, **Merlin H. Mercier** has been made commercial promotion supervisor.

New safety supervisor for San Diego Gas & Electric Co is **C. E. Dunahoo.** He succeeds the late **James E. Smith.**

New assistant engineer of Appalachian Power Co's Charleston district is **Lenzie J. Hendrick.**

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*Trade Name

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GENERAL OFFICES: CENTRALIA, MO.

A. B. Chance Co. of Canada, Ltd., Toronto

Continued from page 46

Components on trial

A. D. Johnston, Reactor Engineer, checks parameter records. All photos courtesy of AEC.

nel controls water flow, temperatures, pressures and other system variables. A level-galvanometer channel continually indicates and records changes in reactor power level, and level-safety channels are included to trip the reactor if unsafe conditions threaten.

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Leeds & Northrup, 4938 Stenton Avenue, Philadelphia 44, Penna. Sales offices throughout the U.S.A.

The State Department has announced the appointment of **Howard W. Cooper,** vice president and assistant to the chairman, Minnesota Power & Light Co, as U. S. delegate to a series of power meetings to be held in Geneva, Switzerland. Meeting will be held Oct. 6-10 under auspices of the U.N.

Arthur L. Clark, personnel director for Virginia Electric & Power Co, has been named personnel manager, assuming the responsibilities of **George E. Kidd,** vice president-personnel, who has retired.

Iowa Illinois Gas & Electric Co has promoted **Clarence Koepke** to operating supervisor of the utility's Moline generating station. He will replace **Bob Reinhold,** who is new operating supervisor at the Riverside generating station.

Raymond D. MacFee has been named, assistant comptroller for both Jersey Central Power & Light Co and New Jersey Power & Light Co.

Edwin W. Morris has been appointed Pacific Coast regional engineering and service manager for Westinghouse Electric Corp. He succeeds **Wilbur A. Howe** who becomes manager of electric service at the company's Pittsburgh headquarters.

OBITUARY

John Donahue, vice president, Hartford Electric Light Co, died recently. He was widely known in electric utility public relations circles.

Clyde Hussey, Arkansas Light & Power Co personnel director, died recently while vacationing. He was the victim of a heart attack.

J. Frank Blake, manager of the Conowingo Power Co, Elkton, Md, died recently of cancer. He was former president of Maryland Utilities Association.

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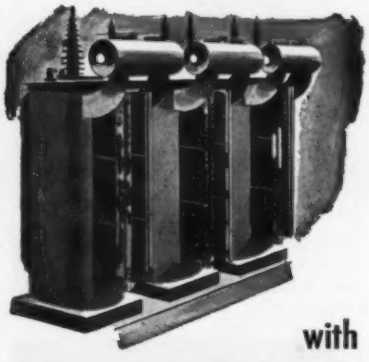

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Copter Dispenses With Roads

(*Continued from page* 68)

bers has increased. This development is partially due to heavier conductor and higher tension, but followed improved equipment design and mobility for handling of heavy loads in remote areas.

For efficient use of present helicopters, towers must be redesigned for better handling of lighter and more sections. Splicing methods must be reviewed. Structural aluminum will be reappraised.

Helicopter designers promise machines capable of lifting whole towers. Edison will review basic tower design to take advantage of potential helicopter operations.

Footings have been evolved for capitalizing on modern augering equipment, and the grillage type may return. Air-lifted pneumatic hand tools can dig wide, shallow trenches more economically than narrow, deep ones. Grillage steel can be hauled in one lift.

It is argued that if roadless lines are built by helicopters, they must be maintained by helicopters, and that the weather which caused the outages may also prevent flying. But Edison feels that a helicopter, even awaiting a weather break, often can get personnel and tools to the trouble faster than a truck.

Edison will specify airlift construction of transmission and distribution lines whenever economics show its prudence. The first case will be the final 15-mile section of the Saugus-Santa Clara 230-kv lines, recently available on completion of R/W negotiations.

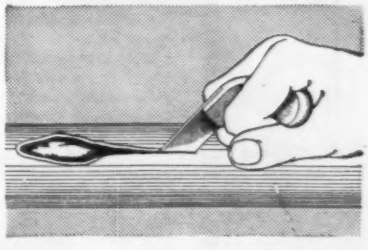
NEW KLEIN

stripping tool

for all types of control cable

Patents 2398979
2691822

Cat. No. 1558



Here is a new tool developed by Klein, designed to strip insulation from all types of control cable, flexible cords, PWC, telephone cable with vinyl or polyethylene jackets and bus drop.

Handle of cast aluminum, light in weight and with convenient grip; knife of tempered tool steel may be sharpened and is easily removed for replacement. This tool strips insulation from a few inches to as many feet as desired swiftly and simply. Does not damage conductors inside weatherproof sheath.

Write for bulletin giving complete information.

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COMPARE THESE ADVANTAGES WITH CONVENTIONAL STRINGING BLOCKS . . .
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NEW LITERATURE

• **HAND TOOLS:** 40-p booklet, "How To Use Hand Tools" has 59 illustrations showing 30 different tools in use. $0.10. Crescent Tool Co, Jamestown, N. Y.

• **CABLES:** Four types of interlocked cables—600-v, 5,000-v, 15,000-v grounded neutral and 15,000-v ungrounded neutral—are described in 12-p illustrated bulletin, RCP-730. Bulletin RCD-701, 4 pp, describes neoprene-sheathed power cables for 3 to 15 kv service. 20-p technical bulletin on cable installation practices, RCT-101, is designed for use by installation crews. $1.00. 50-99, 5% discount; 100 and over, 10% discount. Rome Cable Corp, Rome, N. Y.

Hints on selecting the proper cable construction are contained in 20-p booklet, Bulletin 1117. The Okonite Co, Passaic, N. J.

• **HOISTS:** 8-p bulletin, DH-133D contains data on electric hoists with capacities of 500 to 4,000 lb. American Chain & Cable Co, 929 Connecticut Ave, Bridgeport 2, Conn.

• **TELEMETERING SYSTEMS:** Bulletin EA7A has information on features and operation of TM-16 Telemetering Systems. Control Corp, 718 Central Ave, N.E., Minneapolis 14, Minn.

• **SOOT BLOWERS:** Special design features of long retractable soot blowers are described in Bulletin 1043. Copes-Vulcan Div, Blaw-Knox Co, Erie, Pa.

• **POWER AND LIGHTING CABLE:** 16-p illustrated booklet lists availabilities, property information, current carrying capacities, etc., of aluminum electrical building wire. Kaiser Aluminum & Chemical Sales Inc, 919 N. Michigan Ave, Chicago 11, Ill.

• **OPEN CUTOUTS:** 14-p bulletin 511 covers performance, operation, construction, styles, and specifications of open cutouts. Bulletin 512, 4 pp, covers open link cutouts. S&C Electric Co, 4435 Ravenswood Ave, Chicago 40, Ill.

• **FIRE PROTECTION:** 6-p brochure outlines three most popular types of foam systems for fire protection now in use. Fire Equipment Manufacturers Assn, Suite 759, One Gateway Center, Pittsburgh 22, Pa.

• **WESTINGHOUSE PUBLICATIONS:** 12-p booklet, B-7249, presents advantages of Thermalistic insulation for large motors and generators, synchronous condensers and frequency changers. Booklet B-7286 emphasizes principal features of Shelterfor-M outdoor metal-clad switchgears. Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

(*More New Literature, page* 125)

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• **RUBBER PRODUCTS:** 52-p engineering data handbook discusses molded, extruded, lathe-cut and chemically blown sponge rubber products. $1.00. The Rubber Manufacturers Assn, 444 Madison Ave, New York 22, N. Y.

• **VARIABLE TRANSFORMERS:** Product information, engineering data, connections, ratings and other data are covered in 100-p catalog on standard 50/60 cycle Powerstat variable transformers. Bulletin P258G. The Superior Electric Co, Dept. P258G, Bristol, Conn.

• **CARBON BRUSHES:** Specifications on carbon brushes for motors of various manufacturers are included in 24-p catalog, 21-B. An AISE Standard Brushes chart is included. Sketches show how to determine brush angle bevel and correct nomenclature of terminal types and shunt locations. The Ohio Carbon Co, 12508 Berea Rd, Dept 78, Cleveland 11, Ohio.

• **OUTAGE LOCATORS:** Engineering data sheets and illustrations on automatic outage locators are compiled in one folder. Lotran Inc, Box 2521, Baton Rouge, La.

• **H. K. PORTER PUBLICATIONS:** Two catalogues contain information on Thomas Suspension Insulators and Hardware, and Conductor Clamp Selection Tables. Publication 1000, 36 pp, covers the former, and Publication 1050, 8 pp, the latter. Delta-Star Electric Div, H. K. Porter Company, Inc, Lisbon, Ohio. 4-p technical article discusses basic problems of outdoor switch design and gives specifications for best design practices. Delta Star Div, 2437 Fulton St, Chicago 12, Ill.

• **POWER CONNECTORS:** Design information, technical data, and various specifications of aluminum power connectors are contained in a loose-leaf catalog. Royal Electric Manufacturing Co, 1122 E. 87th St, Chicago 19, Ill.

• **ELECTRICAL DISTRIBUTION MATERIALS:** 12-p catalog booklet No. 1396-H features insulators and hardware used on electrical distribution systems. New additions to the Ohio Brass line are included. Ohio Brass Co, Mansfield, Ohio.

• **GLASS INSULATORS:** 40-p publication, IEC Publication 87, is international specification on glass insulators for overhead lines. Requirements for insulators used with nominal line voltage of 1,000 v and up only are given. $3.00. Dept. DD-7, American Standards Assn, 70 E. 45th St, New York 17, N. Y.

• **INDUSTRIAL TELEVISION EQUIPMENT:** Industrial television equipment available for business and industry is described in 8-p brochure. General Precision Laboratory, 63 Bedford Rd, Pleasantville, N. Y.

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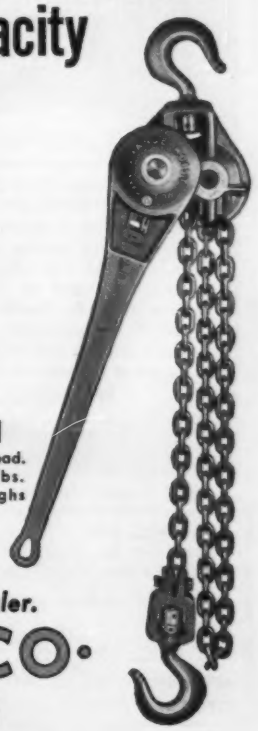

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Public Relations

(*Continued from page* 117)

Because the summary is a by-product of other operations of the information bureau, its out-of-pocket costs are limited to paper, ink and multilith plates.

A one-year-old folder called News Briefs has sharpened collection of news within Public Service Co of Colorado's far-flung operations and also improved internal communications among its 11 divisions.

The bi-monthly publication's growth has been purposely slow.

"We weren't quite sure what volume of news we could gather," says John N. Kerr, director of advertising and publicity. "To start, we planned on only monthly or occasional issues, but we've been able to dig up enough copy within the company to justify twice-monthly publication, which is the schedule we're on now."

The legal-size sheet is laid out in four pages and is multilithed by PSC's reproduction department. Cost is a nominal $100 per issue, Kerr estimates. This includes salaries of two combination reporter-photographers who work part of their time checking a regular list of internal news sources to develop News Briefs items. Also included is the cost for multilith plates, paper, and mailing.

The current press run is 1,700. Ten or 15 copies of each issue are placed in each of PSC's 44 information racks. Individual copies are mailed direct to department heads and supervisors. In the Denver main office area, copies go to opinion leaders, newspaper editors, and radio-TV stations.

Kerr says many editors appreciate the leads provided by the sheet to more detailed stories.

No effort is made to stress employees' news in the sheet. This is left to PSC's monthly employee magazine.

"Our sole endeavor is to help keep people aware of the more important things taking place in the company," Kerr explains.

Often the basic story in News Briefs finds its way into the employee magazine, only with a different emphasis and at greater length, or provides the basis for publicity releases.

SEARCHLIGHT SECTION

CORROSION ENGINEERS

Several attractive openings are available with a highly regarded, major Eastern engineering company. These positions require Electrical Engineering graduates with 5-10 years experience in corrosion control investigation, corrosion testing and solution of corrosion problems on pipelines, underground cables, power plant structures, piers, wharves, water and oil storage tanks, etc.

These positions offer ample opportunity for professional growth and personal achievement. Considerable travel within the USA with possibilities of some overseas work. We invite you to investigate these opportunities by forwarding a complete confidential resume.

P-8600, Electrical World
Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

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RW-8673, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

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Iowa utility has immediate need for two graduate electrical engineers, 25 to 30 years of age, with 3-8 years' experience in distribution engineering or system planning and budget work. Fine opportunity for right men. Provide full details on education, experience, etc.

P-8676, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

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The Meetings Calendar

SEPTEMBER

• **American Institute of Electrical Engineers** — 1st National Conference on the Application of Electrical Insulation and Trade Show, co-sponsored by NEMA, Pick-Carter and Statler-Hilton Hotels, Cleveland, Ohio, Sept. 3-5; Power Industry Computer Application Conference, King Edward Hotel, Toronto, Canada, Sept. 15-17.

Edison Electric Institute — Accounting Division and Section Organization Meeting, sponsored jointly with AGA, Netherland Hilton Hotel, Cincinnati, Ohio, Sept. 8-9; Industrial Power & Heating Group, Wisconsin Dells, Wisc., Sept. 18-19; Meter and Service Committee, Driscoll Hotel, Corpus Christi, Texas, Sept. 22-24; Industrial Relations Committee Round Table Conference, Hotel Drake, Chicago, Ill., Sept. 29-Oct. 1.

Public Information Program—Steering Committee, Biltmore Hotel, New York City, Sept. 10.

Northwest Public Power Association, Inc—Power Use Section Annual Meeting, Malaspina Hotel, Nanaimo, British Columbia, Sept. 10-12.

Maryland Utilities Association—34th Fall Conference, The Cavalier-Sir Walter Raleigh Hotel, Virginia Beach, Va., Sept. 12-13.

Rocky Mountain Electrical League—Annual Fall Convention, Jackson Lake Lodge, Moran, Wyo., Sept. 14-17.

Instrument Society of America—13th Annual Instrument, Automation Conference & Exhibit, Philadelphia Convention Hall, Philadelphia, Pa., Sept. 15-19.

World Power Conference—Sixth International Congress on Large Dams, Statler Hotel, New York City, Sept. 15-20.

Pennsylvania Electric Association—51st Annual Meeting, Penn-Sheraton Hotel, Pittsburgh, Pa., Sept. 17-18.

Northwest Electric Light & Power Association—51st Annual Meeting, Sun Valley Lodge, Sun Valley, Idaho, Sept. 17-19.

Public Utilities Association of the Virginias—40th Annual Meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., Sept. 18-21.

American Society of Mechanical Engineers—Power Division Conference, Hotel Statler, Boston, Mass., Sept. 28-Oct. 1.

• **Missouri Valley Electric Association**—Accounting Conference, Robidoux Hotel, St. Joseph, Mo., Sept. 25-26.

OCTOBER

Indiana Electric Association—Annual Convention, French Lick-Sheraton Hotel, French Lick, Ind., Oct. 1-3.

Electric Companies Public Information Program—Workshop Conference, Radisson Hotel, Minneapolis, Minn., Oct. 1-3.

• **International Association of Electrical Leagues**—23rd Annual Conference, Shoreham Hotel, Washington, D. C., Oct. 1-3.

• **Missouri Valley Electric Association**—Sales & Rural Conference and Home Service Workshop, President Hotel, Kansas City, Mo., Oct. 1-3.

Edison Electric Institute — Prime Movers Committee, Hotel Statler-Hilton, Buffalo, N. Y., Oct. 6-8; Transmission & Distribution Committee, Hotel New Yorker, New York City, Oct. 9-10; Electric System and Equipment Committee, Hotel Barringer, Charlotte, N. C., Oct. 13-14; 5th Annual Area Development Workshop, Hotel Somerset, Boston, Mass., Oct. 15-16; Taxation Accounting Committee, co-sponsored by AGA, Tides Hotel and Bath Club, St. Petersburg, Fla., Oct. 22-24.

• **Oklahoma Utilities Association**—Electric Light and Power Division Conference, Eastern District, Western Hills Lodge, Lake Sequoyah, Wagoner, Okla., Oct. 16; Western District, Lawtonian Hotel, Lawton, Oklahoma, Oct. 17; Accounting Section Conference, Burlingame Hotel, Bartlesville, Okla., Oct. 24.

• Additions this week.

MORE BIG DATES FOR '58

National Electrical Manufacturers Association—Annual Meeting, Atlantic City, Nov. 10-14.

National Association of Railroad and Utilities Commissioners—Annual Convention, Westward Ho Hotel, Phoenix, Ariz., Nov. 17-20.

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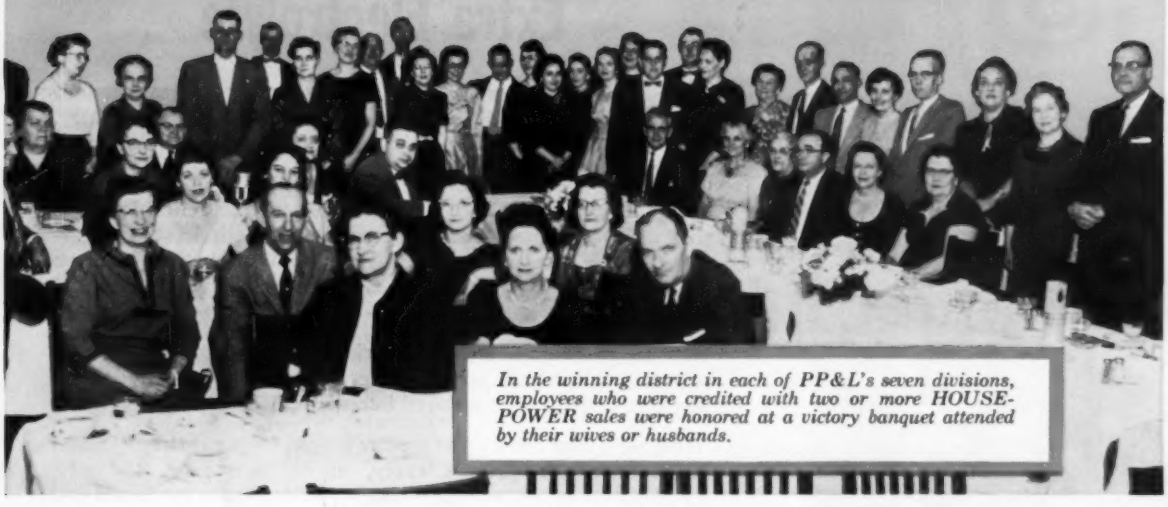

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